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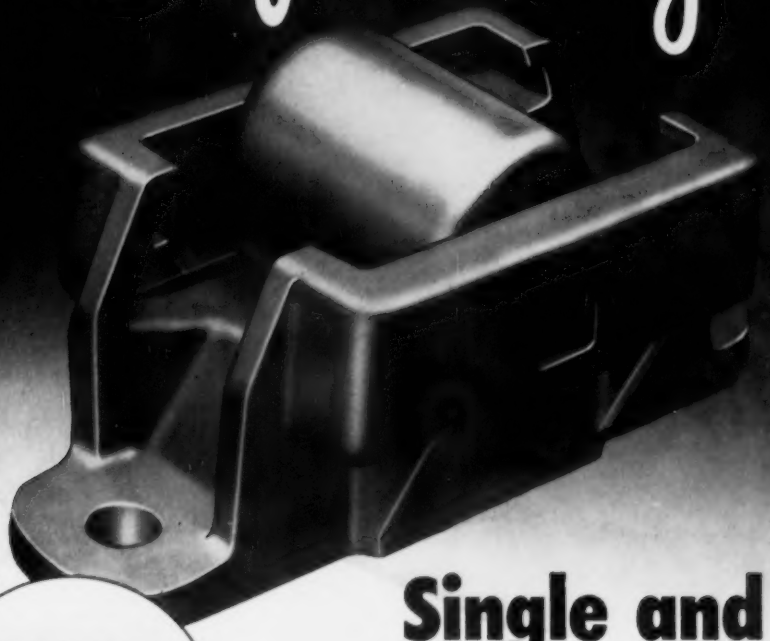

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READERS LAMENTS AND CHEERS . . . . . wherein readers tell what they like—and don't like

KEEPING GOOD MEN

Today's Graduate—Tomorrow's Executive

The question of interesting young engineering talent in the railroad business has been approached by us from several angles. One has been to hire during the annual summer vacation period a few young men still in college who are interested in working for the railroads and learning more about the field. A few of these trainees have returned during the following vacation periods and, upon graduation, come to work on a permanent basis. Those who have not decided on a permanent career "weeded out" while at the trainee level, thus obviating the training of a higher priced man and the loss of that investment.

It has been found also that the title must be more to what the young engineer feels his training and talent entitle him. The word "draftsman" fails to do this justice or to appeal to his feeling of importance. It is an opinion of some that the title of "engineer" in one form or another should be employed, and there is no doubt it would be of value when this can be arranged within the framework of obligations found in agreements and contracts with technical employee organizations.

As to the financial side of the picture, with the exception of the aircraft and electronic fields, the railroads offer the young engineer a comparable rate of pay to that found in other industries. However, the new man is seldom offered a clear view of the railroad's operating problems in the field, at least at the start, to fully equip him with an understanding of what his particular importance is in the way of maintenance and design details while working in the headquarters field. It would be most desirable to be free to assign a new man to various sections of the railroad as part of a basic training program, but this may involve infractions of agreement provisions with technical organizations. An alternative is assigning him, under the supervision of an experienced man, to a builder's plan as an inspector or advisor.

In acquiring and holding promising engineering talent, the basic motives of self-preservation and gratification must be appealed to in the young employee. While other industries may at one time or another, depending upon economic expansion, offer more in the way of salaries, there is no question but that the railroad industry was among the pioneers in holding men in their employ for a lifetime, and the total earnings over the years, coupled with the security of employment, is attractive, indeed. The proper indoctrination of the new employee, including a full realization of his importance to the industry and a clear-cut picture of what lies ahead of him in this field, which is certainly without parallel in the many facets of its operation, is most important. The underlying and long-range problem of attracting today's engineering graduates is the supply of capable and responsible executives a generation from now.

S. M. Houston,
General superintendent motive power, Southern Pacific

Salary Not Everything

There is some doubt in my mind that the question as stated in your editorial, "Why Can't the Railroads Keep Good Men?" is completely accurate as far as a statement of fact is concerned. While it may be true that many college graduates select other industries in lieu of railroading, it would certainly be unfair to imply that those who do select railroading are a mediocre breed of engineers.

The railroad industry has never painted a picture of a rapid-rise from graduate to executive or position of responsibility, but in many cases the young engineer has visions of quickly climbing the ladder of success, often based simply on the strength of his background of education.

There may be a certain amount of discouragement in the fact that railroaders are a healthy clan and many live to a ripe old age. When the graduate stands at the foot of the ladder and looks skyward, he sees younger men further along ready to take the place of those before them. Because of the nature of the beast, railroads cannot boast of a large executive staff and, as the graduate views the future, he can often see only in a vertical position and the relatively few positions available to him.

The trend in which the graduate engineer is exposed to many phases of railroading is a healthy one and one that has been employed by other industries for some time. This is one of the finest ways available to help the engineer in training to appreciate more fully his future position, even though it may be in the second or third management level, because it aids in the creation of a feeling of belonging, or playing a part in the overall plan of the industry.

The complaint that the technical graduate must, of necessity, move from place to place in gaining greater responsibilities is not one peculiar to the railroad industry alone. In fact, no industry that is large enough to have a network of outlying plants, can avoid such a complaint. This is in no way intended to minimize the complaint, nor to offer a remedy, but it is only meant to state that the railroad industry should not be immediately associated with such a condition.

The day of purely technical skills is rapidly waning. No longer is a technical graduate assured of an executive position merely on the basis of having spent four years in institutional preparation. Today, the executive is expected to possess not only certain educational preparation, but he must be a psychologist, a planner, a designer a human relations practitioner, and all of the many other titles made necessary by the technological changes in our society. These arts are not learned during the four or five years required for the technical training, and the successful graduate—the future successful railroad executive—is required to attain them during his embryo railroad experience.

As a recent graduate, I feel that I can speak with some knowledge of the experience of looking up the ladder. The railroad industry may require more of a seasoning than other industries, but from the standpoint of responsibility growth, it is both rapid and challenging, depending quite naturally on the willingness to accept lesser tasks and to maintain a creative and open mind in seeking ways that the company can be improved by personal contribution, rather than based on the theory that "I have the training, now let the boss squeeze it out of me," or even "Now that they've hired me, they owe me a lifetime job." To believe such a theory is to call on ultimate failure, but the graduate is often assuming this attitude and not saying "What can I do; how can I be of service to the company?"

The railroads may have failed in not having inspired the technical trainees with a company spirit from the beginning. It is a difficult task to explain such things as company spirit, contribution to a transportation service, and pride in company to those that have not had the opportunity to feel these things first hand. There is definitely a lack of adequate orientation of pre-employment interview to those within the railroad industry to those interested. This selling program has waited too late if it relies on the sending of a representative to the college, or technical school, just before the time for graduation. Burdened by final examinations and visions of an unsettled future, the individual is in no frame of mind to accept new ideas regarding future employment opportunities.

There is, however, an opportunity of working with the schools and colleges prior to graduation time in contacting the undergraduates to outline the advantages of railroad employment. The co-operative ed-

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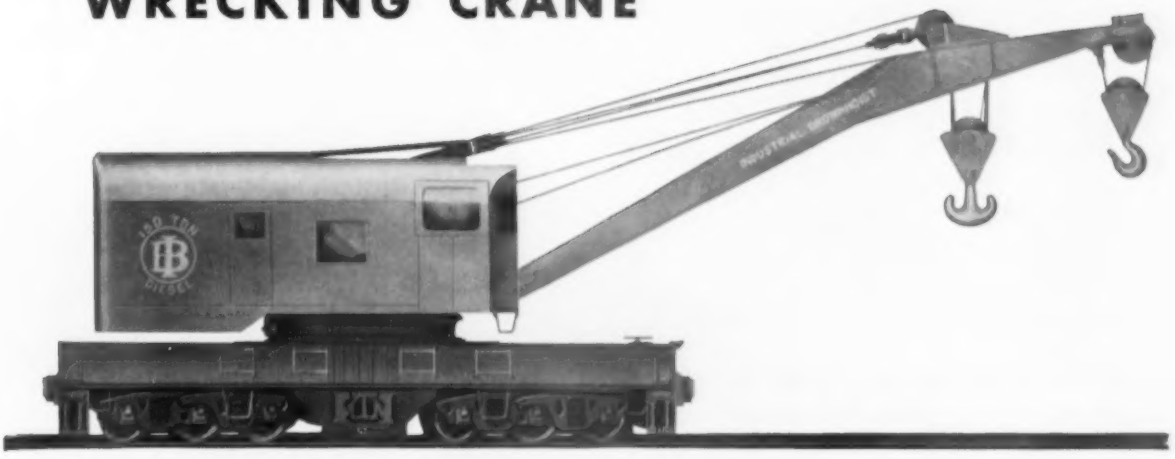

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ucation plans now used by many colleges area valuable way to make such contracts.

These programs of training offer an opportunity to the undergraduate of learning while doing and of letting him feel that he can make great employment contributions to our industry, depending upon his willingness to accept the responsibilities which are identified with that field.

It is unfair to the railroad industry, and quite unfortunate, that the criterion of adequate job opportunities is, or has become, "salary and position," rather than personal contribution to the overall work or employment effort. These are by no means all of the colors necessary to paint the complete picture of railroad employment; it is the intangible things that really make railroading the fascinating industry that it is.

The railroad industry has been classically one of "esprit de corps," and it is the responsibility of every employee on every railroad to radiate the spirit of railroading not only to the graduating senior, but to take every opportunity to pass on the desire to be a part of the rich heritage that belongs to railroading, for in this way, and in this way only, will the level of technically trained employees be maintained by something more than a comparative salary.

W. E. Durham,
Engineer, Richmond, Fredericksburg & Potomac

Accepts Challenge

Your editorial in the May issue of Railway Locomotives and Cars, "Why Can't the Railroads Keep Good Men?" certainly brought out the major reasons. The challenge in the last paragraph to furnish information on how to keep good men is too powerful to be ignored. I do some recruiting of college seniors, so my primary interest is in first attracting the qualified graduate to our railroad and then doing what I can to insure his remaining as a happy, competent and productive employee.

Most of the jobs on the railroad can be done by people of average mental ability and high-school graduates usually more than satisfy this minimum requirement. Out of this large group people of superior mental ability, possessing the other attributes, rise to the top.

Today, more and more of these executives, who for whatever the reason lack a college education, realize that if it were not for the technological improvements provided by the engineers, they would not have a job. So the employment climate is changing from hostility or tolerance to acceptance of the technically trained man. I think all employees can recognize the necessity of hiring a limited number of college graduates annually.

If this is done, give them the desired indoctrination and training and then promote them like anyone else. This means strict impartiality; all candidates for the vacancy must be considered and the best qualified get the job.

Many things are obvious. We are geared to the training of the regular apprentice and may not realize that training on a higher level and at a faster rate is a must for the junior engineer to prevent boredom. The challenge to his abilities must always

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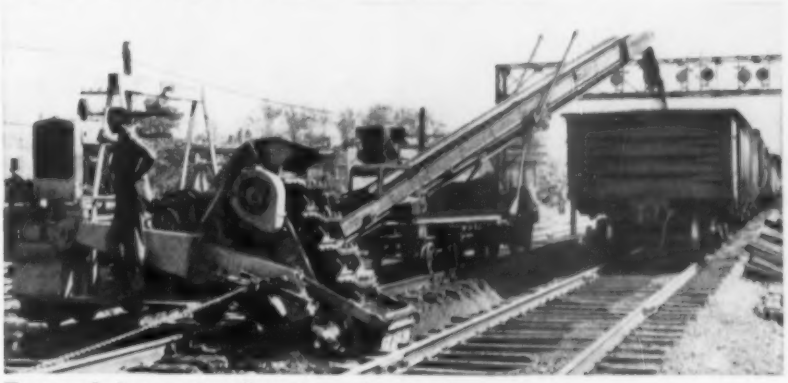

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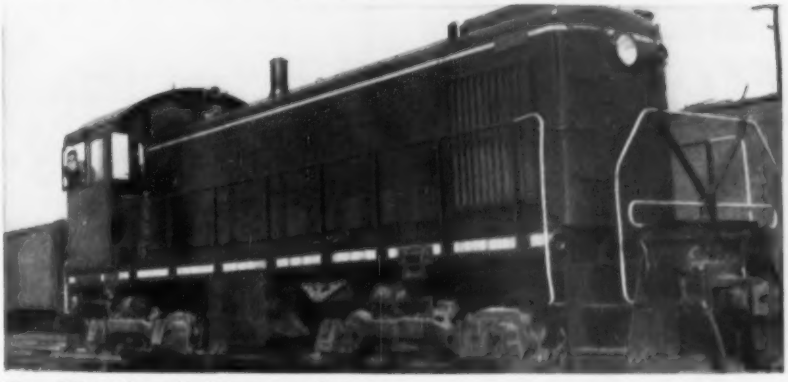

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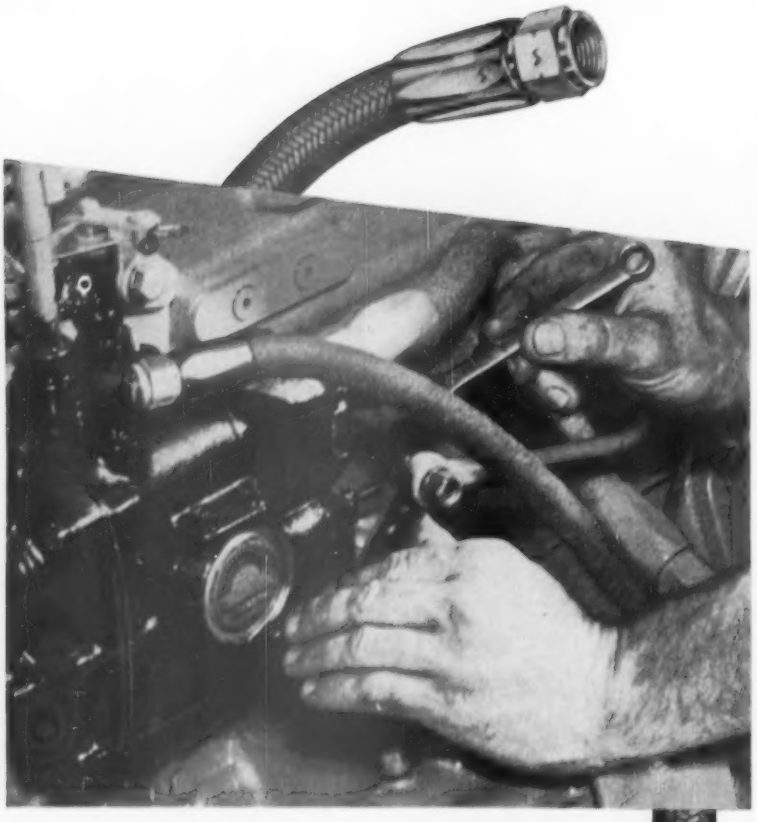

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be there, and this places a responsibility and extra load on the boss to provide the knotty problem or special assignment to stimulate thought processes. If all this seems like special treatment, it is; he was hired with the expectation of his becoming a leader, and we know today that leaders may be born, but they also have to be trained.

I strongly suspect the reason good men remain with the railroad in spite of long hours, frequent moves and frustrations classified as "grief" is that they are happy in their jobs, obtain satisfaction from them, and see some future ahead of them.

Apparently all that is needed is to provide job satisfaction and, in doing so, remember he is a professional man trained to solve problems or reach objectives by means of the exercise of his own intellectual powers. This individual approach carries with it both the right to use initiative and the obligation to keep it free from dictation by anyone else.

M. S. Riegel

(When this letter was written Mr. Riegel was coordinator of training with the New York Central. He is now consulting engineer to the Technical Committee on Wrought Steel Wheels and Axles of the American Iron and Steel Institute as announced on page 22—Editor)

Training Programs Needed

The subject of the editorial is a timely one, referring principally to the railroads keeping college men and technical graduates. However, the heading "Why Can't the Railroads Keep Good Men?" is not, in my opinion, appropriate. Many men employed by the railroads are good men even though they may not be college graduates, and the inference that college graduates are all good men is erroneous.

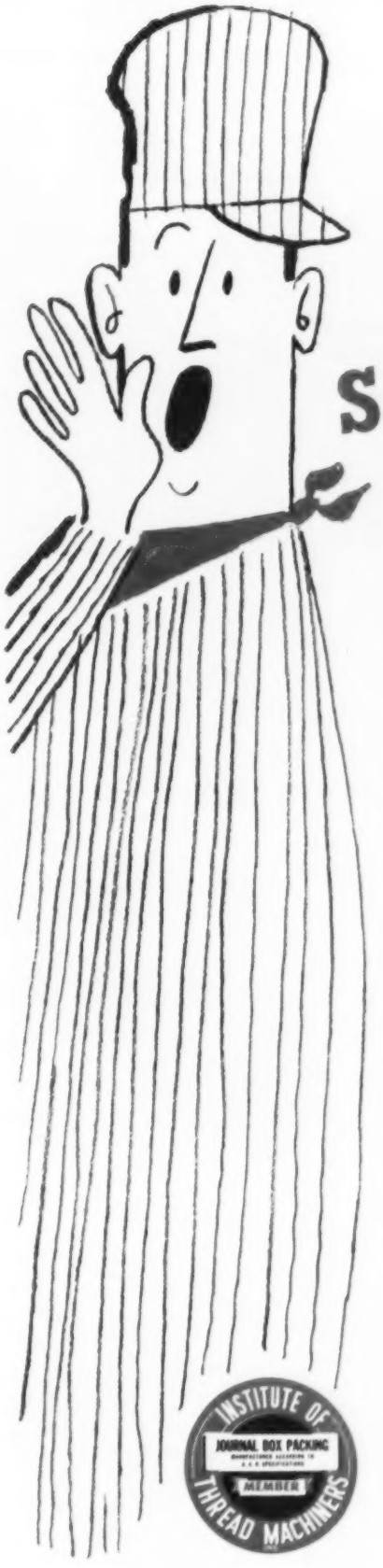
The railroads, with their increased use of more complicated equipment, have a greater need for technically trained men, especially in their mechanical and electrical departments.

In obtaining a college education the men are instructed to study, investigate and learn as much of the various subjects as possible. It is believed the railroads would retain more of their college trained men by permitting them to continue studying and learning as much about all of the various departments' activities on the railroad as possible. All railroads have a wide variety of activities and, with some encouragement, college men could be permitted to study various railroad activities and thereby become so interested in these activities that they would not leave the railroad.

College men are trained to study their work and I doubt that the hours of work alone required of railroad men would influence their decision to leave the railroad, provided they become interested in the various phases of railroading.

Many industrial companies have programs for indoctrinating young men into their organizations and, if these programs are properly set up and carried out for the technically trained men, the loss of these

(Turn to page 100)



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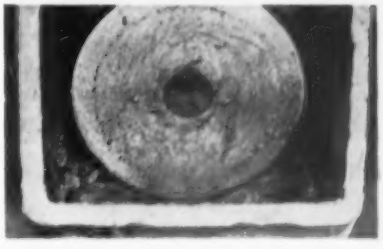

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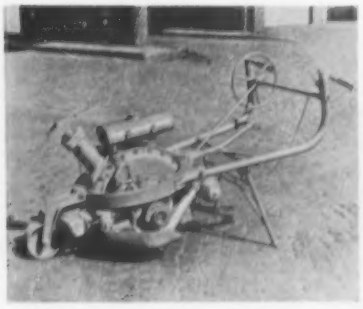

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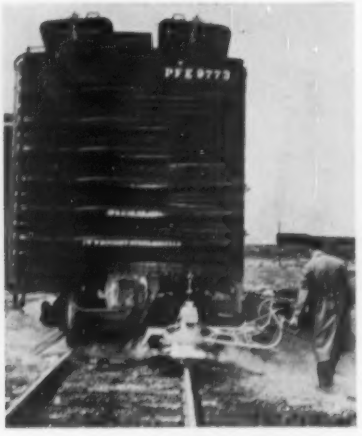

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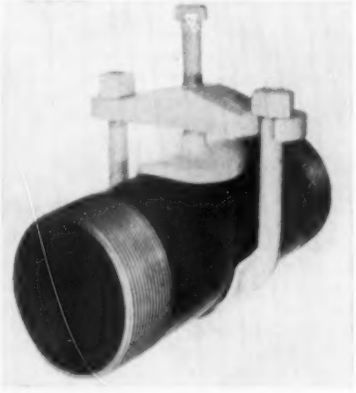
Spectrochemical Analysis of Diesel Engines

The Quantometer, can be used to check the condition of diesel engines through analysis of crankcase oil. Using only a half teaspoon of sample oil, it provides a quantitative analysis in two minutes, recorded on a direct reading chart. Correlation of analysis with known engine data then enables operators to detect wear and other factors before there is a chance of engine wear.

The instrument is said to produce great savings in time over usual procedures. Since it detects elements to the millionth part, it gives immediate data not readily obtainable by other methods.

The device set to obtain quantitative readings on 16 elements, eliminates need for photographic procedures and densitometer measurements. The unit operates on the optical emission principle. It consists of three sections: multisource unit, spectrometer and recording console. *Applied Research Laboratories, Dept. RLC, Glendale, Cal.*



Pipe Leak Patching Tool

For repairing pipe leaks quickly and permanently, this pipe tool is said to answer a long felt need of maintenance men. The device consists of a clamp and patches which are accurately fitted to specific pipe sizes.

The tool is available in two styles—the saddle type in four sizes for use on pipe 6 in. in diameter or less, and the chain type in all sizes from 6 in. up. The patches are made of steel with either Neoprene or asbestos gaskets. The clamp is placed around the leak without shutting off the line or reducing pressure. Then, the patch is applied directly over the leak and sufficient pressure is applied by the clamp to

HYATT HY-ROLL BEARINGS

FOR NON-STOP FREIGHT

LOWER INSTALLATION COST!

Simplified design eliminates fitting adjustments! Only four parts on axle . . . outer races eliminated.

HYATT HY-ROLL BEARINGS are the *economical* answer to your need for roller bearing freight. *Hy-Rolls are so simple* in design they make installation easier, faster, less expensive; and one bearing fits both old and new cars. *Hy-Rolls are so dependable* they eliminate costly inspections, reduce maintenance, lower operating costs. *Hy-Rolls are rugged*—built with straight cylindrical rollers—can carry bigger loads faster and farther. Make sure your big change to roller bearing freight cars pays off now—and in the years to come. *Specify Hyatt Hy-Roll Bearings.* Hyatt Bearings Division, General Motors Corporation, Harrison, New Jersey.

MORE HYATT ROLLER BEARINGS ARE IN USE ON AMERICAN RAILROADS THAN ANY OTHER MAKE

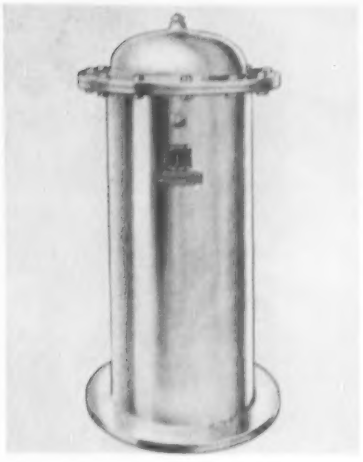
HYATT

HY-ROLL BEARINGS FOR NON-STOP FREIGHT

ANOTHER GM CONTRIBUTION TO RAILROAD PROSPERITY

stop the leak. This patch is then welded to the pipe.

Where welding is hazardous, the manufacturer has developed a cold-weld process. This cold weld is applied as a cement and left in place for 24 to 48 hr, depending on atmospheric conditions. The clamp is then removed and patch becomes an integral part of the pipe. Both patches withstand high pressures. *Atlas Industries, Inc., Dept. RLC, P.O. Box 8152, Houston, Tex.*



Oil Refiner

The Oilpure Refiner is available in various sizes for installation on internal combustion engines, including commercial, marine and locomotive. When installed, it becomes an integral part of the lubricating system and is said to refine the lubricating oil as the engine operates.

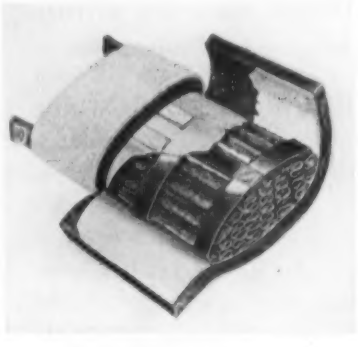
According to the manufacturer, the Oilpure Refiner Company, the engine requires only the occasional addition of oil to maintain correct crankcase level. The purifier acts to neutralize acid crankcase, remove dirt and metal particles and prevent excessive dilution. The units can be transferred from engines to engines of similar capacity. Distributor: *C. Raymond Ahrens, Inc., Dept RLC, 30 Church street, New York 7.*

Coolant Pump Motors

This totally enclosed fractional-horsepower motor is designed especially for driving machine-tool coolant pumps. With its NEMA-C end-shield for direct coupling to the pump, the motor can be mounted horizontally or vertically. Smooth contours, including a closely fitted dripcover simplify keeping the motor free of accumulated metal and dirt particles.

Large grease reservoirs are factory-

filled with a new-type grease, resistant to moisture and oxidation. Locked ball bearings are said to receive a constant supply of lubricant for ten years' normal operation. The terminal box, separated from the rotor fan and windings by a welded baffle, gives lead protection and room for necessary splice connections. A Neoprene washer keeps moisture from entering around the dripcover locking screw and the motor through-bolts. The motor is cooled by both conduction and radiation. Internal fans maintain even internal temperatures by circulating air to the cooler surfaces. *General Purpose Component Motor Dept., General Electric Company, RLC, Fort Wayne, Ind.*



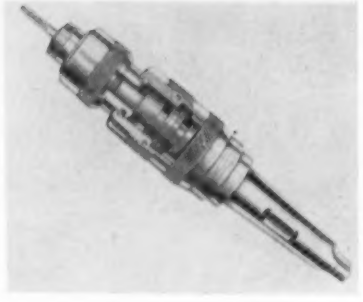
Lubricator Pad

The new Espey lubricating pad features a core of curled animal hair, wick separators, a steel spring construction that keeps the core from collapsing regardless of temperature, a canvas inner wrap covered by an absorbent felt pad, and an outer wicking action cover of tough cotton.

The AAR has granted approval for installation of up to 10,000 car sets of this pad in interchange.

Purpose of the steel spring construction is to keep the pad from collapsing away from the journal. Over this spring is a canvas wrapper which, in turn, is covered with an absorbent felt pad which acts as an oil reservoir. Inside the steel spring is a core of cured curled animal hair. This also acts as a reservoir and keeps the pad resilient.

The outer jacket is of cotton selected because it has high wicking action, is non-glazing and lint free. *Spring Packing Corporation, Dept. RLC 332 South Michigan avenue, Chicago 4.*



Torque Control Tapping Head

This adjustable-clutch tapping head provides automatic torque control for a broad range of working conditions. The head regulates driving torque automatically, according to the hardness of material and type and size of taps, after a simple dial setting is made.

The device, the Tap-Saver, can be used for drilling, reaming, spot-facing and counterboring, in addition to right and left-hand tapping. A chuck permits rapid tool changes for different operations using special tap and drill collets which are part of the set.

There are three standard sizes to accommodate Morse taper shank drill collet numbers 2, 3 and 4, respectively. Each head is supplied as part of a complete set, which includes 10 collets to fit, and a storage box for convenience and protection. In addition, each set has three drill collets of the proper size and number and seven assorted tap collets for right or left hand taps. The three sizes of sets accommodate a range of tap collets from ¼ through 2 in. diameter. *Davis Boring Tool Division, Giddings & Lewis Tool Co., Dept. RLC, Fond du Lac, Wis.*

Conductor Identification

A new process of color coding for the individual rubber insulated, Neoprene jacketed conductors of multiple conductor power and control cables consists of the

(*Continued on page 16*)

the Morton

Two new and unique, non-flammable fabrics.

3-Piece Diaphragm

❶ MORTON TYPE "DL" NON-FLAMMABLE FABRIC

Road tested performance is proving the superiority of the fabric! Woven of Dynel yarns into Morton's 50-50 weave and impregnated with neoprene for waterproofing, it is proving to be resistant to strong detergents and other deteriorating elements. Its resistance to mildew and fungus is excellent.

Completely non-inflammable — will not support combustion . . . a quality inherent in Dynel and Neoprene — not achieved by chemical additives that will gradually leach out.

❷ MORTON TYPE "NE" NON-FLAMMABLE FABRIC

The latest development in diaphragm fabrics!

LIGHT—STRONG—
DURABLE

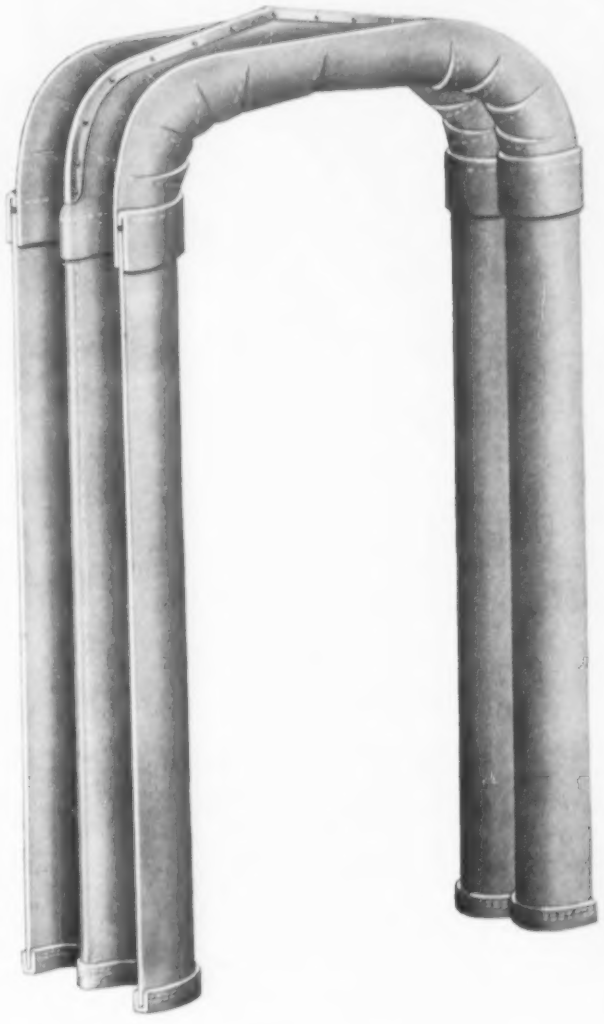
Originally developed and introduced on modern lightweight equipment . . . now also being offered in our standard vestibule diaphragms.

This fabric has a manufacturer's guarantee of 5 years' normal service; much longer service can be expected The most important 1/16 inch in the railroad specialties industry—a single ply core of Dacron, built up to a 1/16 inch thickness with a special compound of neoprene . . . a smooth plate finish on both sides, which will not collect dust and dirt.

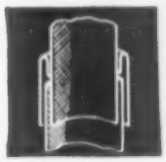
Mildew and rot become a thing of the past. This remarkable fabric is not affected by detergents and other deteriorating elements.

Non-flammable — will not support combustion.

Available in an attractive gray color. Samples furnished upon request.



Advanced diaphragm designs are always under development. Our Engineering staff will welcome the opportunity to work with you on *design* and *new materials* to meet your conditions.



Exclusive sectional construction with a 5" deep pocket assures completely weather tight fit.

Center stiffener on a two or more fold diaphragm is a *channel* which guarantees a tighter and more effective joining of the folds.

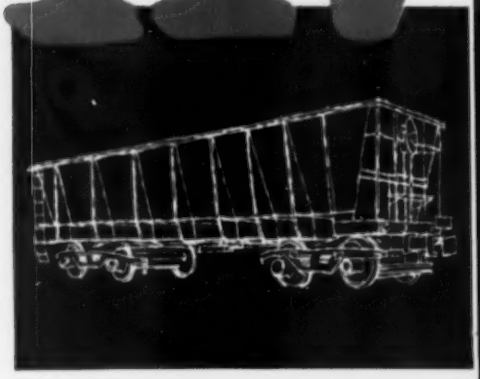
Separate top and legs effect real savings on *replacements*.

Morton
MANUFACTURING COMPANY
5125 West Lake Street, Chicago 44, Illinois

MAKING TEST DATA COMPLETE...

Practically all types of cars now roll on the new steel wheel...

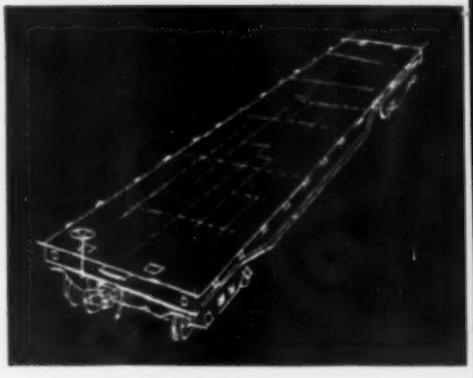
the GRIFFIN

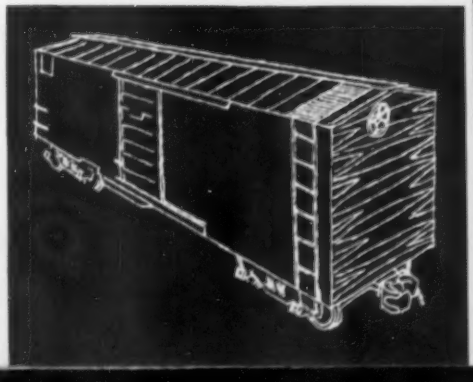


Fifty-five railroads are now using thousands of *new* Griffin EQS steel wheels... *under practically all types of service conditions.*

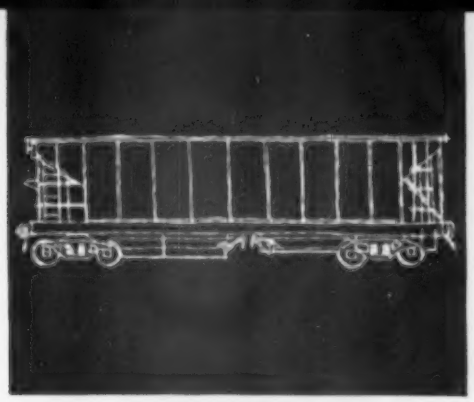
The record of service has been outstanding... it is proving, in the most conclusive possible way, longer life and better wear... *another way of saying lower costs per car mile.*

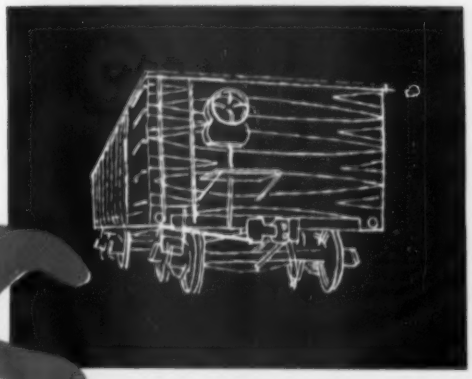
The Griffin EQS wheel comes in fewer tape sizes... accurate in all other dimensions to .020" tolerance ...almost perfectly balanced...and with strong, uniform flanges and rims.





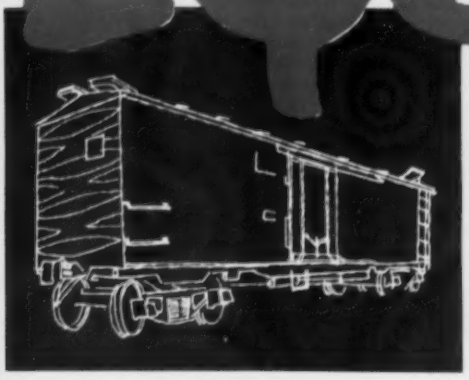
Give the "green" to **GRIFFIN** *and watch your costs go down!*

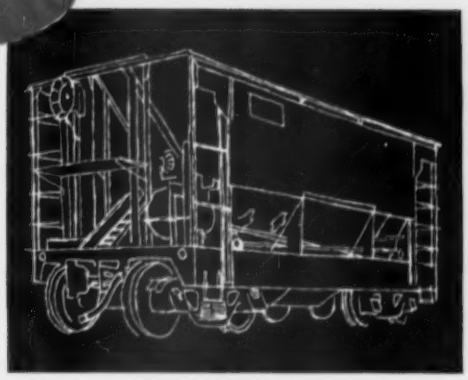


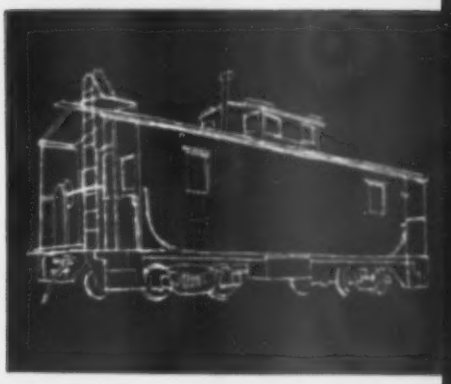


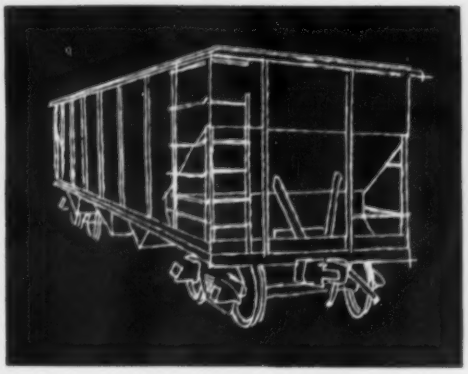
EQS

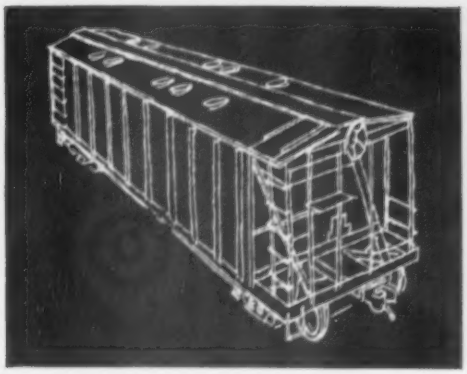
ELECTRIC QUALITY STEEL

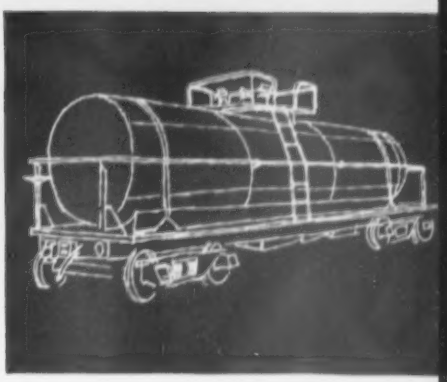


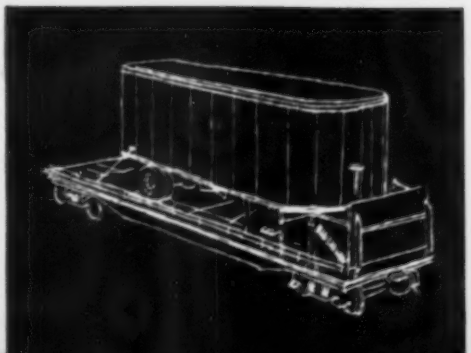


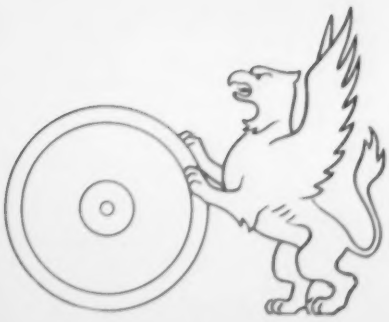












GRIFFIN WHEEL COMPANY

445 N. Sacramento - Chicago 12

Twelve modern plants - strategically located for service

In Canada: GRIFFIN STEEL FOUNDRIES, LTD.
St. Hyacinthe, Quebec

application of brightly colored synthetic rubber base coatings (supplemented where necessary by colored stripes) to the surface of the black Neoprene jacketed conductors. This method of conductor identification complies with an IPCEA Standard. It is said that with the brighter, more easily recognizable colors there will be positive conductor identification and generally improved cable appearance. *General Cable Corporation, Dept. RLC, 420 Lexington avenue, New York 17.*

Decorative Metal Laminate

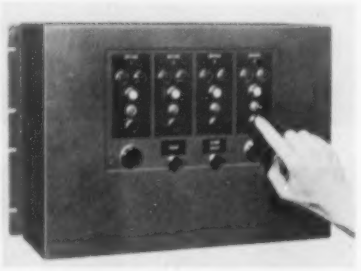
The bulkhead and partition installations in four of the car interiors of Train X are made of a material called Col-O-Vin metal laminate—a vinyl laminated to aluminum, which, it is said, produces high tensile strength with little weight and is virtually indestructible. The vinyl used was Cerulean Blue in a Munster design. It is resistant to fire, scuffing and abrasion.

Col-O-Vin laminates can be machined on such existing standard equipment as the forming or stamping machine. There is no rupture or loss of adhesion or color when such forming as 90-deg crimp bends is done. Vinyl sheeting is supplied in many colors and in such finishes as glossy, matte, grained, marbled, printed, woven or textured. *Columbus Coated Fabrics Corporation, Dept. RLC, Columbus, Ohio.*

Supervisory Control Equipment

A supervisory control system, Type DOS-3, has been designed to provide reliable, economical, and compact centralized control for electric power stations and railway installations. With this equipment, one operator can supervise and control many valves, pumps, motors, generators or any other devices which can be operated electrically. It is available in two ultimate capacities, 25 and 50 points.

The system with its combined "select-



and-operate" control and automatic interrogation indication permits serving many remote stations economically. Only a small amount of common equipment is required for each station. The number of remote stations that can be served is limited only by the ultimate capacity of the system. For example, as many as 50 remote stations can be served by the 50-point system. The complete 25-point system for d-c operation requires only one case 17½-in. x 12¼-in. x 8¾-in., plus panel space for escutcheon plates. Two of these cases house the basic equipment for the 50-point system. Either system can be operated from 48 or 125 VDC. With an appropriate power supply, this equipment can also be operated from 117 VAC. *Motorola Communications and Electronics, Inc., Dept. RLC, 4501 West Augusta blvd., Chicago 51.*

X-Ray Radiography Unit

The Norelco MG 260H unit is designed for rapid inspection of welds, pipe lines, power plants, etc. It is constructed with the X-ray tube and high-tension generator completely enclosed in one unit. Maximum high voltage output is 260,000 volts; minimum, 100,000. A stepless control permits smooth variation between these limits.

The X-ray tube has a 40-deg beam and is enclosed in a shockproofed and rayproofed housing. By combining the tube and generator in one unit, the need for high tension lines is eliminated. A fine focus of 1.5 mm provides excellent radiographic detail.

The device is oil insulated and air cooled and is designed for a load of 4 ma. It operates from a 220-volt ac power supply and is compensated for a range of 210-240 volts. The tube and generator assembly has a diameter of 9 in. and is 41½ in. long. The unit is operated through low-voltage cables connected to a control cabinet which is 18½ in. long, 15½ in wide and 12¼ in. high. When desired, the unit can be adapted for 110- or 440-volt operation. *Research & Control Instruments Division, North American Philips Company, Inc., Dept. RLC, 750 South Fulton avenue, Mount Vernon, N.Y.*

Structural Panel Material

A honeycomb structure of stainless-steel forms a material for construction where light weight, high strength, and resistance to weathering and corrosion are required. Its uses include prefabricated panels and doors, desk tops, furniture; and walls, ceilings and partitions in railway cars.

The stainless steel produces a honeycomb said to be as light as one made of aluminum. Formerly, aluminum was used in thickness ranges from 0.003-in. to 0.006-in. Now aluminum is replaced by stainless steel in thickness ranges from 0.001-in. to 0.002-in. The strength of stainless steel is said to provide a greater strength-to-weight ratio for the honeycomb as well as adding resistance to temperatures up to 1200-deg F. The sandwich structure shows better tensile, compressive, and shear strength and greater dimensional stability, and moisture resistance. *American Silver Co., Dept. RLC, 3607 Prince street, Flushing 54, N. Y.*

Electric Motors

These Linc-Weld motors, available in standard sizes from 1 to 40 hp, are said to be the first in this range with extruded plastic insulation. The present line, complies with NEMA specifications, is built in the open type frame and torque design B.

The thermo-setting insulation is molded into and around the stator windings. After the resin sets, it becomes a tough, rigid and durable mass. In addition to chemical protection, the insulation provides thermal protection. Hot spots that do not receive ventilation are eliminated. The plastic also is said to provide a high degree of physical protection. Even though the motors are built in the open type frame, they may be used as splash-proof units and as totally enclosed units in many applications. *Lincoln Electric Company, Dept. RLC, Cleveland 17.*

PS-1 mending: Monon style

Standardized design speeds repair and rebuilding

The concept of Box Car Standardization is ten years old. When Pullman-Standard engineered the PS-1 Standardized Box Car in 1946, every consideration for strength, durability, performance, shipper acceptance, low maintenance and low first cost that the world's largest carbuilder could contribute was included. The results were confirmed by railroad industry acceptance.

But an additional PS-1 benefit was not so obvious; a benefit which is becoming more and more appreciated by all PS-1 owning railroads, large and small. That benefit is the ease with which accident damaged PS-1s can be restored to like-new condition, with even limited shop facilities. This is possible because standardization makes PS-1s stronger to begin with and better able to survive wreck damage. And standardization's precision building allows new interchangeable Pullman-Standard parts to be installed to replace those damaged beyond salvage.

The Monon was selected to demonstrate the ease with which PS-1s can be mended. Monon shop facilities are adequate, and the know-how and skill of its mechanical department makes PS-1 repairs all-in-a-day's work.

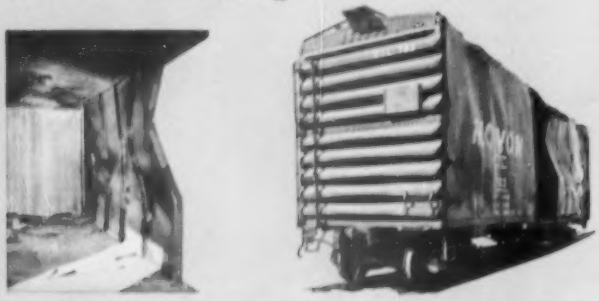
Monon 783, a PS-1 Box Car, was wrecked on a foreign line. It rolled over, coming to rest on its roof. Lading was a full car of canned goods. A lesser box car than a PS-1 would have been scrapped, but Monon 783 was sent home for repairs. How Monon craftsmen, aided by standardization, put this damaged car into like-new condition testifies not only to the ability of the Monon Shops but also to the unique repair-ability of the PS-1 Standardized Box Car.

MONON PS-1s survive wrecks

before THE WRECK . . . MONON 783

Monon 783, a Standardized PS-1 Box Car was built in December 1952. It had, therefore, been in hard general service for three years before it was wrecked in November, 1955. It is the 40'6" model PS-1, with a 6' door, welded sides, riveted ends and roof and all the inherent quality known to Pullman-Standard at the time it was built.

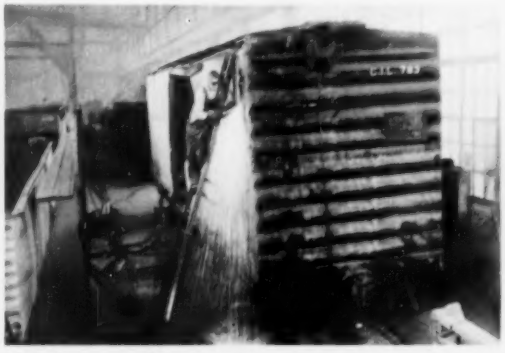
the wreck damage . . .



MONON 783 was part of a derail accident. The car left the tracks, slid forward off its trucks, rolled over and came to rest on the roof.

View of car interior, above left, shows severe side sheet crumpling with extensive deformation of side posts, side plate and door post. Despite this distortion, not a single side post-side sheet weld fractured or opened. Note that "B" end interior lining and floor are practically undamaged. Exterior, right above, shows progressive damage along one-half car length. Both "A" and "B" ends withstood damage and remained sound and straight. No weld unions of side sheet to side plate or to side sill parted, even where damage was most severe. All rivets remained tight.

LEFT SIDE, PICTURED RIGHT ABOVE, remained unharmed with no evidence of damage. Roof sheets were crushed, but revealed no light leaks, tears, or broken seam caps or carlines. Examination of underframe showed alignment to be true, with damage to crossbearers and bolster bottom cover plates where the car body slid over the trucks. Monon car repair personnel stated that a wreck of this kind would normally damage an ordinary box car beyond economical repair.



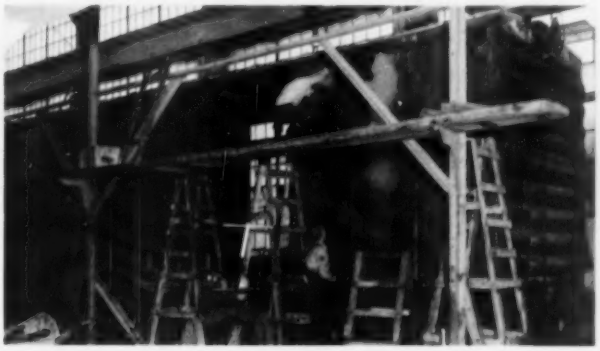
the repairs . . . **MONON 783** was lifted and placed on blocks. Car segments damaged beyond salvage were cut out. This scene shows the ladder being burned from the car.

Ruined side and roof sheets were removed next. Note the top-to-bottom burns which cut sides into easily handled pieces, and the method used to support side segments with crane hooks.

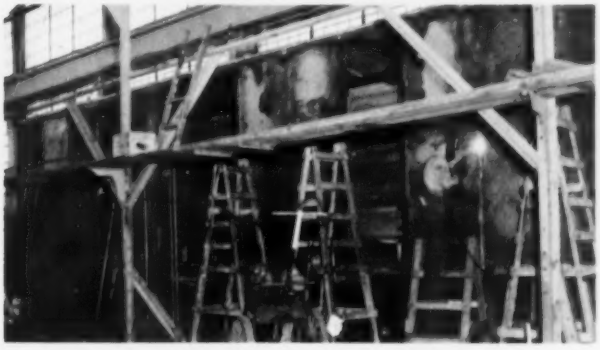
Here is No. 783 shorn of damaged sides and roof. Floor was removed to allow access to underframe. Repair process specified cooperage as part of returning No. 783 to like-new condition.

Crossbearer arms, deeply scored by wreck-contact with wheels, were burned off. Standardized replacements, obtained from Pullman-Standard, were merely welded into position on center sill . . . another benefit of the standardization concept.

thanks to STANDARDIZATION



Standardized roof and side sheets, P-S supplied, were next applied. Here side sheets are being positioned against standardized side posts. Such standard parts fit exactly, require minimum fitting and reworking.



Standardized side sheets are joined by arc welding after being butted together. Rivets attach ends and sides at corner posts. All standard parts used were obtained from Pullman-Standard and designed for fast, easy wreck repair.

the results... **MONON PS-1 NO. 783, ready to go back into service. All damaged parts have been replaced or straightened. Interior has been reinstalled, and the entire car cleaned and painted with eye-catching new Monon styling and colors. Monon craftsmen stated that an ordinary box car damaged as extensively as PS-1 No. 783 would have been scrapped. Standardized PS-1 strength and construction, combined with PS-1 parts in the hands of skillful Monon car repair experts made reconstruction of No. 783 quick, easy and economical. This repair-ability of PS-1s is another of the inherent advantages of standardization which railroad owners are relying on for maximum performance and service from their rolling stock. Like the Hoosier Line, your railroad can avail itself of the many benefits of freight car standardization through purchase of any of the four types of cars in the P-S standardized line.**

During the more than three years that have passed since Monon 783 was built, research, engineering, field inspection and production advances have made many PS-1 Box Car changes and improvements: A PS-1 built in 1956 is even better than one built in 1952. But Monon 783 is representative of the more than 80,000 PS-1s in service, since at the time it was built, it was the very best product of its kind and the best the world's largest carbuilder could produce. The kind of carbuilding quality that allowed it to survive a serious wreck is reason why today nearly one-twelfth of all U.S. box cars are PS-1s.

PS-1 Box Cars are fabricated of completely tested and proved components that derive their strength from working together in mutual support. And because each detail of each component is thoroughly engineered and precisely made, car parts are interchangeable and fully standardized. This means P-S Roofs, Ends, Sides, Underframes and other components are readily available for application to wrecked PS-1 Box Cars like Monon 783. They are installed with minimum time, labor and normal shop facilities because they fit, thanks to standardization.

Similar railroad industry acceptance is being granted the other standardized freight cars in the Pullman-Standard line. More recently introduced than the PS-1, these units are developing comparable reputations for strength and performance: PS-2 Covered Hopper Car, PS-3 Open Top Hopper Car, and PS-4 all-purpose Flat Car. Each of these cars, like the PS-1 Box Car, is available to buyers with the benefit of design flexibility which permits choice of several sizes and the application of certain specialties and accessories to fit individual railroad requirements.

All P-S freight car products are the result of the shared experience of Pullman-Standard and its railroad customers. Engineered, tested, mass produced to the specified needs of the railroads and their shippers, standardized freight cars are the only rolling stock built with full consideration for the rigors of interchange to serve best on all parts of The Great American Railway System.

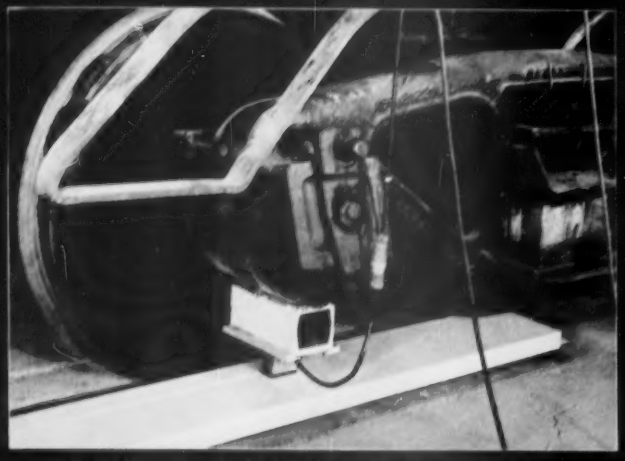
BUILT TO GROVE SHOT ON THE
GREAT AMERICAN RAILWAY
System
BY PULLMAN-STANDARD

WORLD'S LARGEST MANUFACTURER OF FREIGHT AND PASSENGER CARS

PULLMAN-STANDARD

CAR MANUFACTURING COMPANY
SUBSIDIARY OF PULLMAN INCORPORATED
221 NORTH LA SALLE STREET, CHICAGO 1, ILLINOIS
BIRMINGHAM, PITTSBURGH, NEW YORK, SAN FRANCISCO, WASHINGTON

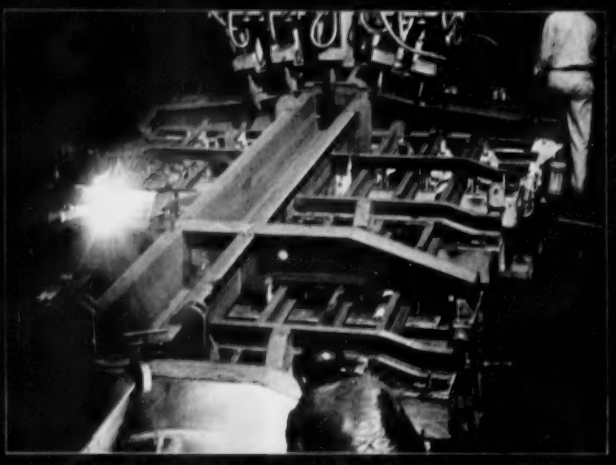
how the Monon's standardized PS-1s were built



Research and Development tests of PS-1s are of infinite variety and number. For example, movies taken by a slow motion camera show actions and reactions the human eye can't see. This technique discloses what actually happens during impacting such as freight cars experience during running service and train make-up.

A corps of trained Field Service Engineers keeps a critical eye on service performance of PS-1s and other cars. Veteran cars as well as newly built PS-1s are thoroughly examined. Hundreds of detailed condition surveys each year make certain that PS-1s keep pace with railroad operating advances.

PS-1 parts, such as sides, are production line assembled as components before application to cars. Pullman-Standard production facilities build with such precision that even whole sides, such as this, swing smoothly into exact position and become an integral part of the car.



Pullman-Standard has invested millions of dollars in recent years to up grade production processes and keep PS-1 output in pace with railroad demand. Heavy investment has been made in dies, jigs and fixtures which facilitate precision building by expert craftsmen and give buyers better cars at lower first cost.

Built to serve best on the
GREAT AMERICAN RAILWAY SYSTEM

WORLD'S LARGEST MANUFACTURER OF FREIGHT AND PASSENGER CARS

PULLMAN-STANDARD

CAR MANUFACTURING COMPANY

SUBSIDIARY OF PULLMAN INCORPORATED

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TYPE F INTERLOCKING COUPLER and ATTACHMENTS

plus

Buckeye DEPENDABILITY

. . adds up to longer, trouble-free service!

- New Safety Shelf—to support mated coupler in event of pullout.
- Interlocking—Guard arm and aligning wings similar to type H Coupler.
- Reduced free slack.
- Improved positive anti-creep.
- Easier operation.
- Increased strength.
- Reduced wear.
- Coupler, Yoke, Follower, and Striker interchangeable as a group with present standards.

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Refer Adv. No. 11878

Ask for Bulletin No 202. .

The Buckeye Steel Castings Co.

★ COLUMBUS, O.
★ NEW YORK, N.Y.
★ CHICAGO, ILL.
★ ST. PAUL, MINN.

AISI Assumes Work of Tech. Board, Wheel Industry

The American Iron and Steel Institute, through its Technical Committee on Wrought Steel Wheels and Axles, has assumed the work hitherto done by the Technical Board of the Wrought Steel Wheel Industry, and will also disseminate technical information concerning wrought-steel axles.

Malcolm S. Riegel, formerly coordinator of training, New York Central, will be consulting engineer to the newly formed committee, which will be located at 230 North Michigan avenue, Chicago, where Charles Bryant was formerly in charge of the Technical Board.

The chairman of the Technical Committee on Wrought Steel Wheels and Axles is G. T. Jones, metallurgical engineer, United States Steel Corporation.

Shannon Assistant Locomotive Inspection Chief

Howard H. Shannon is the new assistant director of locomotive inspection at the Interstate Commerce Commission. He took his oath of office late in June, a few days after the Senate confirmed his appointment by President Eisenhower.

Mr. Shannon has been a member of the commission's staff of locomotive inspectors with headquarters in New Jersey. In the assistant directorship he succeeded James E. Friend, who returned to the field staff as district inspector at Fort Worth, Tex., several months ago. The other assistant directorship has been vacant since March 31, 1954, when Allyn C. Breed retired.

North Western Plans New Freight-Car Shop

Plans have been announced by the Chicago & North Western for what will be the largest freight-car facilities on the road. The shop, scheduled for completion in 1957, will be located at Clinton, Iowa, and will be about 160 ft wide by 1,000 ft long, completely enclosed. It will include a modern wheel shop and air-brake shop, and will be arranged for assembly-line operation both on repair and construction work.

The shop will have a capacity for constructing 1,000 new cars and making heavy repairs to 7,000 cars annually. Over 500 men will be employed.

Canadian Road Testing Another Diesel Transmission

A German-built diesel-hydraulic road switcher is undergoing three months of service tests on Canadian roads. The 750-hp MAK unit is recently operating on CNR's Quebec and Nova Scotia lines and will later go to other Canadian roads for testing. Hydraulic transmission is Voith unit with one fluid coupling and two torque converters.

Chrome-Plating Liners Multiply Life

Chrome plating cylinder liners has extended their life three to four times over unplated liners—that is the general opinion of railroads reporting their experience to the AAR's diesel parts committee of the Purchases and Stores Division. Several roads have reported service up to a million miles from chrome plating.

Besides the saving from the extension of the cylinder liner life, there is a secondary advantage in the elimination of all but one size of pistons and rings. This not only reduces inventory but it avoids possible mis-application of the improper size piston or rings in a power assembly.

The committee also concluded from reports furnished to it that hard chroming many additional diesel items has proven successful, permitting the maintenance of standard sizes of bearings in particular, or at least a minimum of undersize bearings for crankshafts.

Among the recommendations for assignment was the continuation of the study of chrome plating of liners and its extension to such other diesel items as crankshafts, cam shafts and wrist pins also the study of a possible arrangement with the chrome platers for the unit exchange of such items.

Hydra-Cushion Reduces 10 mph Shock to 4 mph

Possibility of easing a 10-mph coupling shock to the equivalent of a 4-mph impact is demonstrated by a car bearing a pilot model of the Southern Pacific's hydra-cushion underframe, which has been undergoing SP road tests for a year (Railway Age, May 9, 1955, p. 30).

The SP has announced it plans to go ahead with a program to build several box cars with the hydra-cushion underframe, which was developed by the Stanford Research Institute under the SP's sponsorship. The hydraulic principle eases coupling shock by allowing for controlled release of some of the oil compressed in the underframe's hydraulic cylinder by the coupling action.

ORDERS AND INQUIRIES FOR NEW EQUIPMENT PLACED SINCE THE CLOSING OF THE JULY ISSUE

DIESEL-ELECTRIC LOCOMOTIVE ORDERS

Road and builder	*No. of units*	*Horse-power*	*Service*	*Other detail*
CHICAGO, ROCK ISLAND & PACIFIC:				
Electro-Motive	10	.....	Road switch	GP-9 type
ONTARIO NORTHLAND:				
General Motors Diesel	6	1,750	Road switch	For early 1957 delivery.
READING:				
Fairbanks, Morse	2	2,400	.....	Train Master units. Cost, $508,000. Delivery expected in October.
SOUTHERN PACIFIC:				
Electro-Motive; Alco Products;	90	1,750	Freight	Deliveries of 154 units to be completed by April 1957.
Fairbanks, Morse	26	1,200	Switching	
	38	900	Switching	

FREIGHT-CAR ORDERS

Road and builder	*No. of cars*	*Type of car*	*Cap. tons*	*Length, ft.*	*Other detail*
ERIE:					
Greenville Steel Car	300	Gondola	70	..	Estimated cost, $2,500,000. Delivery expected to start next May.
FRUIT GROWERS EXPRESS:					
Pacific Car & Fdry	400	Refrigerator	50	40-0	Reassigned from company shops.
Company shops	500	Refrigerator	70	50-0	Mechanically refrigerated.
LOUISVILLE & NASHVILLE:					
ACF Industries	500	Pulpwood	70	..	Estimated cost, $4,100,000. Delivery expected Feb.-April 1957.
MAINE CENTRAL:					
Pullman-Standard	20	Cov. hopper	70	..	Estimated cost, $173,000. Delivery expected in April 1957.
NORTH AMERICAN CAR:					
Pullman-Standard	125	Cov. hopper	70	..	Approximate unit cost, $8,200. Delivery March 1957.
RAILWAY EXPRESS AGENCY:					
General American	500	Refrigerator	50	..	Cost, $10,600,000. Delivery of cars, to be equipped to operate in passenger-train service at speeds up to 100 mph, expected to begin in mid 1957.
VIRGINIAN:					
Company shops	1,000	Hoppers	70	..	Construction to begin about May 15, 1957.

PASSENGER CAR ORDERS

Road and builder	*No. of cars*	*Type of car*	*Other detail*
UNION PACIFIC:			
ACF Industries	15	Baggage	Delivery of these 50 cars expected second quarter 1957.
	35	Mail storage	

INQUIRIES AND NOTES

LOCOMOTIVES:

Illinois Central.—Will order 70 diesel-electric locomotive units next year. Anticipates 100% dieselization in 1958.

Northern Alberta.—Will start dieselization early next year with purchase of five diesel-electric units at estimated cost of $1,000,000.

SAND THE TRACKS . . . NOT THE BEARINGS

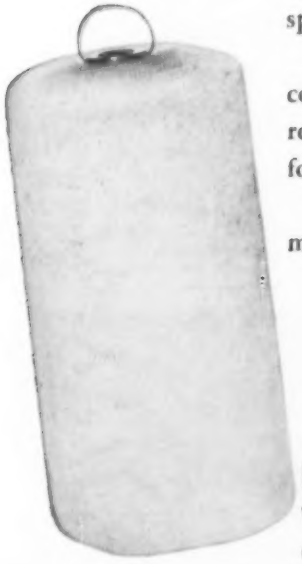
IN A SINGLE RUN FROM NEW YORK TO CHICAGO A DIESEL ENGINE CAN PICK UP ENOUGH GRIT . . .

to ruin it!

The GRIT is there . . . the engine picks it up . . . NOW, IT'S UP TO THE FILTER TO CONTINUOUSLY REMOVE IT! Abrasive substances are the enemy of operating costs and operating schedules. In bad weather they're useful on the *tracks,* but in lubricating or fuel oil—they spell disaster.

WIX Oil Filter Cartridges are the sound answer to the menace of oil contamination. WIX has studied the problem . . . conducted the continuous research to KNOW the answers . . . engineered filter cartridges specifically for railroad diesel service to provide maximum "engine-wear insurance."

Write for the WIX Railroad catalog and particulars on how you, too, may have a specialized study made on your oil filtration problems.



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J. E. McLeod

E. A. Kuhn

Atchison, Topeka & Sante Fe

W. L. Huebner, master mechanic at Los Angeles, appointed assistant general manager. Headquarters, Chicago.

Bessemer & Lake Erie

Greenville, Pa.

M. R. Seipler, assistant superintendent car department, appointed superintendent car department.

E. P. Jaxtheimer, assistant general car foreman, appointed assistant superintendent car department.

Canadian National

Henry J. Betts, electrical engineer, Central region, Toronto, appointed chief electrical engineer, Montreal.

J. D. Sylvester, electrical engineer, Montreal, appointed electrical engineer, Central region, Toronto.

Robert Burn, supervisor of staff training, mechanical department, appointed electrical engineer, Montreal.

Alexander Bonner, locomotive foreman at Nutana roundhouse, Saskatoon, appointed general foreman, Calder shops, Edmonton, Alta.

J. S. McQuire, general foreman at Edmonton, appointed general foreman, Stratford motive power shops.

Canadian Pacific

Ottawa, Ont.

R. J. Mayhew, car foreman, retired.

H. E. D. Smith, appointed car foreman.

Chesapeake & Ohio

(System now divided into Eastern, Central, and Northern Regions, with headquarters at Richmond, Va., Huntington, W. Va., and Detroit, respectively.)

M. I. Dunn appointed vice-president—operations, in charge of combined transportation, mechanical and engineering departments, Headquarters, Cleveland.

J. E. McLeod appointed staff assistant to vice-president—operations at Cleveland. Formerly chief mechanical officer.

E. A. Kuhn appointed chief mechanical officer at Richmond. Formerly general superintendent motive power and machinery.

C. A. Coleman, car foreman, appointed general car foreman at Newport News, Va.

Chicago & North Western

Lawrence L. Steuber appointed general superintendent, car department. Formerly superintendent, New York Central Despatch car shop at East Rochester, N. Y.

Richard E. Powers appointed car-shop superintendent. Formerly general foreman, New York Central Despatch car shop at East Rochester, N. Y.

Chicago, Milwaukee, St. Paul & Pacific

Laurence Wylie, electrical engineer, retired.

E. C. Barnes, assistant engineer, electrification department, appointed electrical engineer.

Davies Yard, Milwaukee

J. E. Palmer, general car foreman at Minneapolis, appointed district general car foreman at Davies Yard.

D. D. Fisher, general car foreman (nights), appointed district general car foreman.

V. L. Waterworth, assistant general car foreman, freight-car shop, appointed assistant district general car foreman.

G. L. Wood, assistant district general car foreman at Savanna, Ill., appointed assistant shop superintendent at Milwaukee shops.

H. A. Grothe, district general car foreman with jurisdiction over car department matters at Minneapolis and St. Paul, given jurisdiction over Minneapolis heavy repair shop and H&D Division.

George J. Johnston, district master mechanic at Deer Lodge, Mont., appointed assistant superintendent motive power, Lines West, at Tacoma, Wash.

Erie

Edward J. Kelley appointed general foreman at Dunmore, Pa.

Jesse H. Smith appointed general foreman at Hornell, N. Y.

Harold C. Green, AAR inspector, appointed chief AAR inspector at Cleveland.

Lehigh Valley

Sayre, Pa.

J. G. Hoffman, Jr., engineer of tests, resigned.

R. E. Springer, water inspector, appointed engineer of tests.

Long Island

Morris Park, N. Y.

C. P. Soffel appointed chief diesel inspector.

E. L. Bradsak appointed general electrical inspector.

Missouri-Kansas-Texas

Parsons, Kan.

Charles H. Griffith, chief electrical engineer, retired.

Howard G. Doyle, general mechanical inspector, appointed chief electrical engineer.

Earl V. Seifert, assistant engineer of tests, appointed general mechanical inspector.

New York Central

New York

W. E. Buck, supervisor machinery and tools, retired.

D. L. Mitchell, assistant supervisor shop machinery and tools, appointed supervisor shop machinery—mechanical.

P. R. Brustman, secretary Machinery and Tool Committee, appointed assistant supervisor shop machinery—mechanical.

W. J. Rohrer, secretary Committee on Shop Labor, appointed supervisor personnel—mechanical.

G. C. Churcher, general apprentice instructor, appointed supervisor training—mechanical.

A. L. Simons appointed assistant industrial engineer.

Reading

J. L. Madenfort, master mechanic, Shamokin Division, retired.

Southern

Alexandria, Va.

Charles E. Webb, assistant engineer of tests, appointed engineer of tests.

Ambrose E. Hinson, material inspector, appointed assistant engineer of tests.

Spencer, N. C.

Albert B. Dinkins, Jr., appointed road foreman of engines.

John H. Jackson appointed road foreman of engines.

Knoxville, Tenn.

J. W. Coleman, Jr., appointed assistant general foreman maintenance at Coster Shop.

John H. Coleman appointed cost control engineer at Coster Shop.

Toledo, Peoria & Western

Randle H. Egbert, chief engineer, appointed chief engineer and mechanical officer.

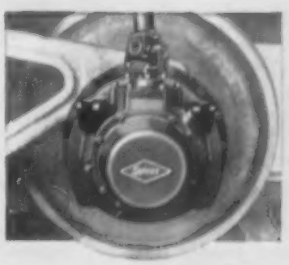
from ample electrical current supplied by the new ½ to 5 KW Spicer Generator Drive

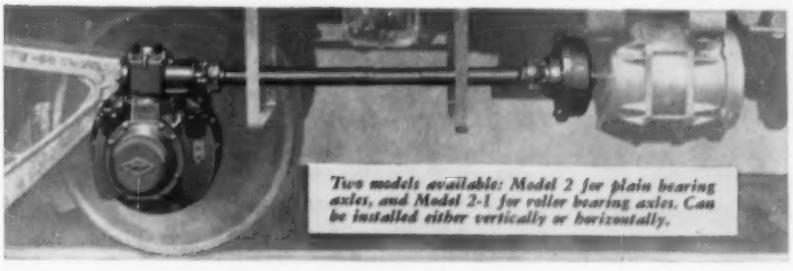
Specific demands for electrical current in modern railroading . . . especially in baggage, mail, refrigerator and caboose cars . . . are met amply, steadily and reliably by the Spicer ½ to 5 KW Generator Drive.

The new Spicer Drive delivers the power for this ½ to 5 KW current with all the standards of efficiency and dependability established by the large, time-proved Spicer Positive Gear Generator Drive. More than 11,000 large Spicer Drives are now in use on over 70 railroads all over the world.

The Spicer Railway Generator Drive for radio, lights, refrigeration and other electrical equipment consists of a very simple application of quiet, long-lived spiral bevel gear and pinion mounted at the end of a standard axle, thereby permitting rapid inspection and maintenance. The drive from the gears is positive and constant through Spicer Universal Joints and Propeller Shaft to the Spicer Safety Clutch which is attached to the generator. This safety clutch absorbs heavy shock loads and disconnects the drive line in case of an excessive overload, thus protecting the generator from damage.

Spicer Positive Railway Generator Drive can be quickly and economically adapted to new car designs and reconditioning jobs. Write for further details.





Two models available: Model 2 for plain bearing axles, and Model 2-1 for roller bearing axles. Can be installed either vertically or horizontally.

Spicer

DANA CORPORATION
Toledo 1, Ohio

SUPPLY TRADE NOTES

K. W. Galliger

NEW YORK AIR BRAKE COMPANY.—*Karl W. Galliger* appointed director of engineering, succeeding *Thomas W. Johnson*, who has been appointed group executive in charge both of the Kinney Manufacturing Division and the new Vacuum Equipment Division.

■

THOMAS A. EDISON, INC.—*Robert H. Weeks, Jr.*, San Francisco district manager, Edison Storage Battery division, has been appointed New York district manager, succeeding *Frederick D. Van Lew*, who died recently. The new district manager at San Francisco is *Robert S. James*, who has worked both as a field and service engineer there.

■

PAXTON-MITCHELL COMPANY.—*Don M. Davis* has been named eastern sales and service engineer.

■

A. M. BYERS COMPANY.—*Paul A. Benoit* and *Albert L. Timm* have been assigned to the New York division office as field service engineers.

■

THE TIMKEN ROLLER BEARING COMPANY.—*Joel Hektner*, railway engineer at Canton, Ohio, has retired.

■

ELECTRIC SERVICE MANUFACTURING COMPANY.—*Warren E. Erbe*, district sales manager in St. Louis, has been appointed assistant manager, Transportation Division, with headquarters in Philadelphia.

■

WINE RAILWAY APPLIANCE COMPANY.—*N. E. Weiffenbach* has been appointed vice-president-sales of the Wine Company, Division of Unitcast Corp.

■

ELECTRIC STORAGE BATTERY COMPANY.—*Clifton G. Grimes* has been appointed vice-president and director of re-

(*Continued on page 88*)

SELECTED MOTIVE POWER AND CAR PERFORMANCE STATISTICS

FREIGHT SERVICE (DATA FROM I.C.C. M-211 AND M-240)

Item No.		Month of April		4 months ended with April	
		1956	1955	1956	1955
3	Road locomotive miles (000) (M-211):				
3-05	Total, steam	3,751	4,963	16,660	19,366
3-06	Total, Diesel-electric	36,929	34,198	148,155	135,640
3-07	Total, electric	733	740	2,897	2,819
3-04	Total, locomotive-miles	41,646	40,109	168,610	158,637
4	Car-miles (000,000) (M-211):				
4-03	Loaded, total	1,677	1,624	6,719	6,269
4-06	Empty, total	923	897	3,703	3,533
6	Gross ton-miles-cars, contents and cabooses (000,000) (M-211):				
6-01	Total in coal-burning steam locomotive trains	9,832	12,010	41,156	44,290
6-02	Total in oil-burning steam locomotive trains	645	1,547	3,974	5,241
6-03	Total in Diesel-electric locomotive trains	107,009	97,705	423,173	379,661
6-04	Total in electric locomotive trains	2,272	2,272	8,718	8,545
6-06	Total in all trains	120,638	114,256	480,225	440,666
10	Averages per train-mile (excluding light trains) (M-211):				
10-01	Locomotive-miles (principal and helper)	1.03	1.02	1.03	1.02
10-02	Loaded freight car-miles	43.2	43.4	42.8	42.3
10-03	Empty freight car-miles	23.8	23.9	23.6	23.8
10-04	Total freight car-miles (excluding caboose)	67.0	67.3	66.4	66.1
10-05	Gross ton-miles (excluding locomotive and tender)	3,109	3,052	3,039	2,973
10-06	Net ton-miles	1,428	1,368	1,399	1,327
12	Net ton-miles per loaded car-mile (M-211)	33.0	31.5	32.7	31.4
13	Car-mile ratios (M-211):				
13-03	Per cent loaded of total freight car-miles	64.5	64.4	64.5	63.9
14	Averages per train hour (M-211):				
14-01	Train miles	18.8	19.0	18.7	19.0
14-02	Gross ton-miles (excluding locomotive and tender)	57,721	57,268	56,657	55,846
14	Car-miles per freight car day (M-240):				
14-01	Serviceable	47.1	46.6	46.8	45.1
14-02	All	45.4	43.8	44.9	42.4
15	Average net ton-miles per freight car-day (M-240)	967	890	947	850
17	Per cent of home cars of total freight cars on the line (M-240)	41.4	47.9	41.7	50.3

PASSENGER SERVICE (DATA FROM I.C.C. M-213)

3	Road motive-power miles (000):				
3-05	Steam	741	1,405	3,361	5,509
3-06	Diesel-electric	20,113	19,570	81,057	80,562
3-07	Electric	1,286	1,304	5,165	5,364
3-04	Total	22,140	22,279	89,583	91,436
4	Passenger-train car-miles (000):				
4-08	Total in all locomotive-propelled trains	227,253	227,528	918,331	922,915
4-09	Total in coal-burning steam locomotive trains	4,666	8,000	20,308	31,930
4-10	Total in oil-burning steam locomotive trains	992	3,409	7,002	13,387
4-11	Total in Diesel-electric locomotive trains	206,151	200,804	829,381	815,547
12	Total car-miles per train-mile	9.84	9.80	9.83	9.71

YARD SERVICE (DATA FROM I.C.C. M-215)

1	Freight yard switching locomotive-hours:				
1-01	Steam, coal-burning	243,603	262,694	997,528	998,715
1-02	Steam, oil-burning	29,347	41,570	110,963	164,416
1-03	Diesel-electric[1]	3,778,920	3,480,073	15,363,753	13,892,386
1-06	Total	4,055,399	3,790,724	16,485,074	15,082,503
2	Passenger yard switching hours:				
2-01	Steam, coal-burning	5,430	8,482	26,573	38,624
2-02	Steam, oil-burning	3,130	5,046	11,861	19,324
2-03	Diesel-electric[1]	245,242	234,689	989,694	971,980
2-06	Total	278,813	273,753	1,131,275	1,132,151
3	Hours per yard locomotive-day:				
3-01	Steam	6.0	5.1	6.0	4.8
3-02	Diesel-electric	15.9	15.2	16.0	15.3
3-05	Serviceable	15.8	15.0	16.0	15.0
3-06	All locomotives (serviceable, unserviceable and stored)	14.3	13.1	14.4	13.0
4	Yard and train-switching locomotive-miles per 100 loaded freight car-miles	1.67	1.62	1.70	1.67
5	Yard and train-switching locomotive-miles per 100 passenger train car-miles (with locomotives)	0.76	0.74	0.76	0.76

[1]Excludes B and trailing A units.

SUMMARY OF MONTHLY HOT BOX REPORTS

	Foreign and system freight car mileage (thousands)	No. of cars set off between division terminals because of hot boxes			Miles car set off
		System	Foreign	Total	
April, 1952	2,766,314	3,826	7,759	11,585	238,784
April, 1953	2,850,753	3,383	6,435	9,818	290,359
1954					
April	2,570,518	3,079	5,149	8,228	312,411
May	2,713,511	4,416	6,510	10,926	248,353
June	2,662,375	6,597	9,617	16,214	164,202
July	2,678,234	7,956	10,912	18,868	141,946
August	2,696,135	7,568	9,742	17,310	155,756
September	2,614,432	6,740	8,882	15,622	167,355
October	2,852,825	5,182	6,985	12,167	234,472
November	2,717,219	2,515	3,467	5,982	454,232
December	2,751,644	1,501	2,294	3,795	725,070
1955					
January	2,714,070	1,813	2,701	4,514	601,256
February	2,517,483	2,266	3,970	6,236	403,701
March	2,830,398	2,717	5,076	7,793	363,197
April	2,787,705	3,471	6,485	9,956	280,002
May	2,931,850	4,860	8,664	13,524	216,788
June	2,945,955	6,080	10,226	16,306	180,666
July	2,906,558	8,086	13,635	21,721	133,813
August	2,954,439	8,555	14,358	22,913	128,941
September	2,923,592	5,896	10,469	16,365	178,649
October	3,025,177	3,966	7,182	11,148	271,364
November	2,950,228	2,010	3,972	5,982	493,184
December	2,922,034	1,819	3,774	5,593	522,444
1956					
January	2,925,109	2,029	4,302	6,331	462,029
February	2,794,161	2,570	5,611	8,181	341,542
March	3,027,684	2,517	6,212	8,729	346,853
April	2,930,389	3,202	6,881	10,083	290,626

for over 25 years . . .
THE "STANDARD" OF THE INDUSTRY

Sprague Air-Push windshield wiper motors and equipment are used on over 90% of the newest passenger trains as well as heavy-duty workhorses. These ruggedly constructed motors have completely replaceable parts, instant starting, more power and are misers on air.

MINOR REPAIRS can be made on-the-job with the Air-Push REPAIR KIT.

Don't buy a new motor!
Send it in for Factory Reconditioning
A warranted major overhaul, at ½ the cost of a new one, carries a 1 year warranty.

Sprague DEVICES, INC.,
MICHIGAN CITY, INDIANA, U.S.A.

LITTLE WONDER FOUNTAIN BRUSH
NEW 100%
DU PONT TYNEX NYLON
Bristles
SCRUBS — WASHES — RINSES — IN ONE OPERATION
bristled with Du Pont TYNEX NYLON

COMPLETE WITH 1 FT. HANDLE **$4.65**
COMPLETE WITH 2-FOOT HANDLE **$4.98**
COMPLETE WITH 4 FOOT HANDLE **$5.98**
THE ORIGINAL *100% TYNEX BRUSH*

100% DuPont **"TYNEX"** Nylon **BRISTLES**

K.C. No. 101T 7" Round, 4' Hdl.	$14.44
K.C. No. 102 T 8½"x4"—4' Hdl.	$14.44
K.C. No. 103T 12"x4"—6 Ft. Hdl.	$19.95
K.C. No. 104T 6" Round—4' Hdl.	$8.30
K.C. No. 105T 7½"x3"—4' Hdl.	$8.30
K.C. No. 106T 6" Round—4' Hdl.	$11.50
K.C. No. 107T 10"x3"—4' Hdl.	$11.50

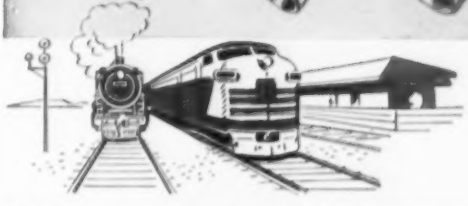
K. C. No. 108T—11¾"x3" oblong, 5' handle $12.81
K. C. No. L.59T—8"x3" oblong, 4' handle $10.24
K. C. No. 116T—16"x2½" oblong, 5' handle $21.26

100% "Tynex" bristles are guaranteed to outlast ordinary bristles as much as six (6) to one (1). Write for complete catalogues and price lists. All K.C. Models available with 50% Tynex and Horsehair mixture at lower prices.

K. C. FOUNTAIN BRUSH CO., 3714-18 MAIN, K. C. 11, MO.
EXCLUSIVE FOUNTAIN BRUSH MAKERS

HARDENED and GROUND for LONGER wear

EX-CELL-O PINS AND BUSHINGS



Keep your equipment out of the shop and on the rails with Ex-Cell-O steel pins and bushings. They give from four to six times longer service than ordinary pins and bushings. The tough ductile core of Ex-Cell-O pins and bushings withstands shocks, vibration; their hard case and fine finish resist abrasive action.

52-29

Standard styles and sizes of Ex-Cell-O pins and bushings for steam, Diesel, and passenger car equipment are given in the new Ex-Cell-O Bulletin 32559. Write today for your copy.

RAILROAD DIVISION
EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN

Cuts down "DRAG"... cuts operator fatigue

No more energy wasted on handling heavier, less flexible welding cables. U. S. Royal Gold *Fluted* Welding Cable not only cuts down "drag" and operator fatigue, but also facilitates welding in cramped quarters.

EXCLUSIVE! U. S. Royal Gold's unique yellow jacket of 60% natural rubber provides unbeatable visibility, reduces the hazard of accident which is present with *black* cable. Also, the yellow provides contrasting color to black for conductor identification when two cables are used on welding machines.

LONGER LIFE! The greater flexibility of U. S. Royal Gold means greater dependability at terminal connections, minimum maintenance. Higher visibility reduces danger of accidental damage, adds more life to cable.

COOLER TO HANDLE! The unusual *fluted* jacket provides greater surface area and thereby dissipates heat faster.

SUPERIOR IMPACT RESISTANCE! Proved by tests to be greater than that of conventional constructions.

GREATER MOISTURE RESISTANCE! That's because of the special 60% natural rubber insulation. Added protection is provided by the jacket, also of 60% natural rubber. Get U. S. Royal Gold at electrical supply houses.

Free Folder Gives Facts demonstrating the superiority of U. S. Royal Gold Fluted Welding Cable. Write to us for your copy at Rockefeller Center, New York 20, N. Y.

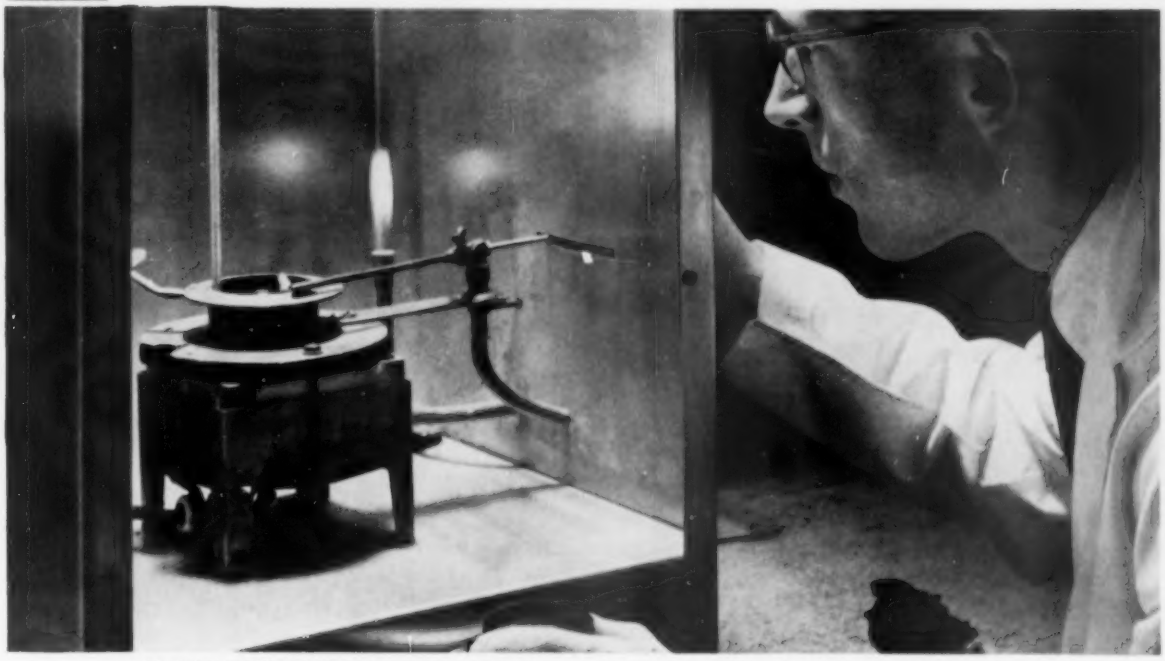
US RUBBER

Electrical Wire & Cable Department

United States Rubber

Dow . . . industry's most complete line of chlorinated solvents

DOW



NO FLASH OR FIRE POINT is shown for CHLOROTHENE when tested by the Cleveland Open Cup Method, the standard procedure.

Here's convincing proof of why Motive Power Departments like to clean with effective, safer CHLOROTHENE

CHLOROTHENE GIVES FAST, thorough cleaning when used on diesel locomotive armatures, electrical cabinets, generators, traction motors and other equipment.

Railroads' rigid safety standards extend to *all* departments. Safer cold degreasing solvents have been demanded for some time by Motive Power Departments. This demand is now ideally met with CHLOROTHENE*.

The great advance demonstrated above, *lack of a flash or fire point* for CHLOROTHENE, is *one* of the properties that make it a real safety solvent. Another, of equal importance, is *much lower toxicity:* CHLOROTHENE has an M.A.C. rating of 500 ppm. This figure is 2½ times the rating for trichloroethylene and a full 20 times greater than carbon tetrachloride's rating.

And versatile? CHLOROTHENE (Dow 1,1,1-Trichloroethane, Inhibited) can be sprayed or used effectively as a wipe, dip or bucket cold cleaner. This stabilized Dow degreasing solvent has very high stripping power, yet gives extremely low corrosive effects. Call your Dow distributor . . . use CHLOROTHENE . . . and bring new safety into your shops. For detailed technical information, please return coupon to THE DOW CHEMICAL COMPANY, Midland, Mich. *Trademark

THE DOW CHEMICAL COMPANY, Dept. S-949H-1, Midland, Michigan
Send me technical information on CHLOROTHENE.
I'm interested in how well it cleans:
Name ____ Title ____
Company ____ Address ____
City ____ Zone ____ State ____

you can depend on DOW SOLVENTS DOW

COBRA® SHOES give in 18,500,000 car miles

This service has substantiated the following

FACT #1

Friction value is stable

FACT #2

High friction value, permitting low shoe forces and simplified rigging, contributes importantly to lightweight train development.

FACT #3

Stopping distances meet existing standards
—WET or DRY—HOT or COLD—
Substantiated by actual railroad service.

The COBRA®

Product of the combined research

Westinghouse Air Brake Company

Specialists in Braking

RAILROAD FRICTION

outstanding performance of ACTUAL SERVICE!

outstanding facts:

FACT #4

With braking performance matched,
Wheel mileage between turnings
is increased 50% to 100%.
Shoe mileage is increased
400% to 500%.

RESULT! Savings up to $900 per passenger car per year!

SHOE

facilities of...

Johns-Manville

Specialists in Friction Materials

Registered U. S. Trademark Composition Brake Shoe

PRODUCTS CORPORATION, Wilmerding, Pa.

Narrow planks of high strength low alloy steel containing nickel take concentrated wheel loads of lift trucks and heavy machinery. Plastic filler in tight-grip nailing grooves between each plank allows any conventional bulkhead arrangement and lading blocking. The filler also permits carrying fine bulk loads of all kinds. Design and construction developed by Pullman-Standard Car Mfg. Co., Chicago 3, Illinois.

Nailable steel flooring in freight cars!
Superior Performance with Nickel Alloy Steel

This flooring stays in class A condition and keeps cars in revenue service. It cuts maintenance expense as well as loss and damage hazards.

These advantages stem from a Pullman-Standard development that makes new use of high strength low alloy steels containing nickel.

Cuts weight . . . resists corrosion

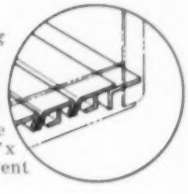
Lightweight sections of these steels give users the same strength and durability as heavier sections that would be necessary with plain carbon structural steel. What's more, these steels containing nickel offer 4 to 6 times greater resistance to atmospheric corrosion, and as a result, they retain much of their original strength over years of use.

In addition, by using the high tensile nickel steels, the new flooring provides superior resistance to impact, battering and abrasion. These steels respond readily to the cold forming and welding operations used during fabrication.

Sold under various trade-names by many steel companies, high strength low alloy steels containing nickel along with other alloying elements, offer a multitude of advantages. Learn how they can help you cut deadweight, add load capacity and prolong equipment life.

Send for a copy of *"Nickel-Copper High Strength Low Alloy Steels."* It's yours for the asking. **Write for it now.**

Key plank in center of flooring makes joints symmetrical on both ends of car. Each plank is welded to those adjoining, and to side sills, center sill and stringers. Thus made integral, floor increases over-all strength of car.



End of floor. Planking provides 99 nailing grooves in standard 50'-6" boxcar. Each plank is individually reinforced the entire length with 2"x1½"x 3/16" angle to prevent dishing.

INCO TRADE MARK

THE INTERNATIONAL NICKEL COMPANY, INC. 67 Wall Street New York 5, N. Y.

Why NATIONAL TRADE MARK *brushes are best for diesel-electric switchers*

For the constantly varying service conditions of switcher locomotives, you need brushes with proven commutating ability. Here are some of the reasons why you can depend on "National" brushes:

- Healthy film keeps commutator in excellent condition for longer life.
- Top performance under varied loads—from idling to steep climbs with full load.
- High brush strength to absorb constant shocks from frogs, crossovers and switches.
- Millions of test miles go into the proving of each grade before it is offered for regular service.

For all types of diesel operation "National" brushes give you more for your brush dollar.

NATIONAL BRUSHES **Best for all types of equipment . . . preferred for all types of service**

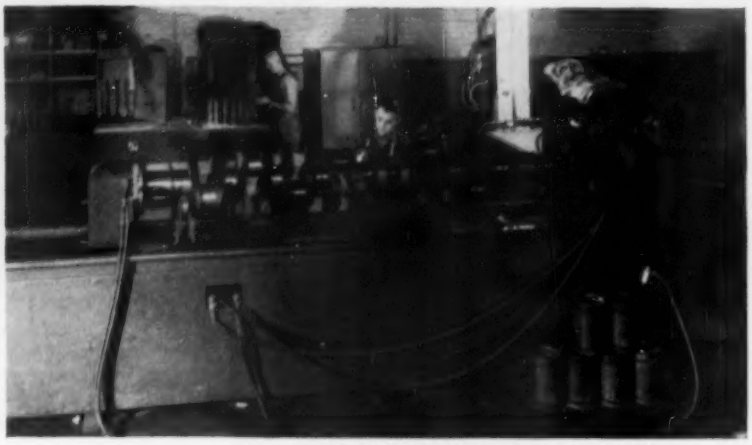
The term "National", the Three Pyramids Device and the Silver Colored Cable Strand are registered trade-marks of Union Carbide and Carbon Corporation

NATIONAL CARBON COMPANY • A Division of Union Carbide and Carbon Corporation • 30 East 42nd Street, New York 17, N. Y.

Sales Offices: Atlanta, Chicago, Dallas, Kansas City, Los Angeles, New York, Pittsburgh, San Francisco. *In Canada:* Union Carbide Canada Limited, Toronto

MAINTENANCE OF WORK EQUIPMENT is a must for accident-free, uninterrupted operations. A tiny crack can be a serious matter when it appears in a crane hook. To the naked eye it may appear to be only a scratch, yet it can open further and further under load. The end result: failure in service and subsequent costly damage. Photo above shows a Magnaflux indication of such a crack.

Case Studies:
NONDESTRUCTIVE TESTING SYSTEMS



MAGNAFLUX-MAGNAGLO ON DIESELS checking a crankshaft at the Rock Island Maintenance Shops, Silvis, Illinois

Longer Service Life Assured by M Methods

"OFF THE ROAD" EQUIPMENT INSPECTION — The YM-5 is a 100% portable kit. It offers Magnaflux or Magnaglo inspection without need for any electrical connections. Adjustable permanent magnets in the yoke find all types of surface cracks in any magnetic material. Ideal for use in the shop or the field for inspecting rail, welds, and many parts of motor equipment and machinery of every type.

When "on the road" equipment is off the road for overhaul, repair or maintenance — fast, low cost, nondestructive M test equipment in your shop can be your assurance of full "availability" and longer service life.

Finding cracks in precision-made diesel parts requires precision testing equipment designed for the job. Magnaglo equipment is used by most major railroads to find *all* cracks in every working part of a diesel. Undetected cracks of this nature can mean road failure, high-cost unscheduled repairs and even more serious mishaps.

Magnaglo and Zyglo units for railroad inspection mark every crack with a glowing fluorescent line on the part itself. They positively detect any and all crack-type defects at lowest operating cost.

These test systems are recommended by railroad authorities as the "standard" accepted test for crack-type defects.

Magnaflux Corporation offers a wide variety of nondestructive testing methods for inspecting all types of "on" and "off" the road railroad equipment.

For detailed information regarding M applications for your specific inspection problems, call in one of our experienced Magnaflux engineers, or write today.

MAGNAGLO "HIGHBALLS" AXLE INSPECTION FOR LOWER COST

Inspect with Magnaglo and be sure that every axle that goes back into service is fit for service. Under Magnaglo black light, all cracks instantly appear right on the part itself as glowing indications, impossible to miss. Magnaglo is fast, low cost — and fully reliable.

HALLMARK OF QUALITY IN NONDESTRUCTIVE TEST SYSTEMS

Write for complete details concerning any of the above case studies, (excerpts from MAGNAFACTS), or ask for our new booklet on Lower Manufacturing Costs.

Take Your Inspection Problems to the House of Answers . . .

MAGNAFLUX CORPORATION

7320 W. Lawrence Avenue • Chicago 31, Illinois

New York 36 • Pittsburgh 36 • Cleveland 13 • Detroit 11 • Dallas 19 • Los Angeles 58

Pour savings into your diesels...

with Gulf Dieselmotive

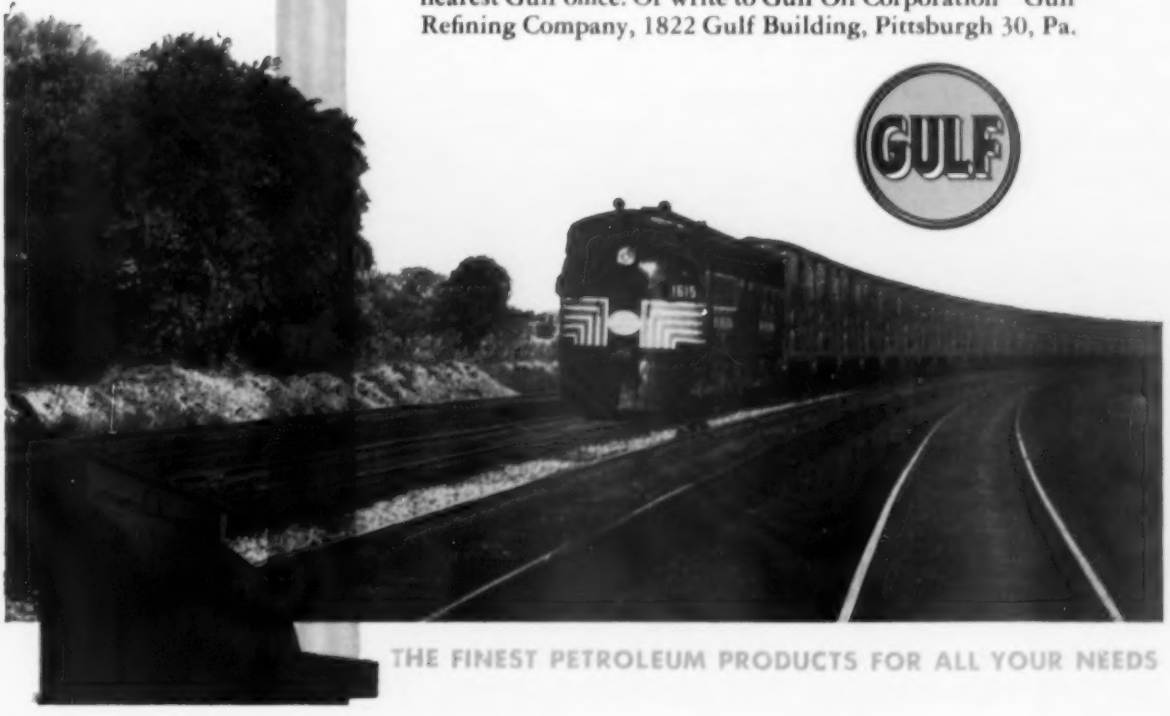
Gulf Dieselmotive is the lubricating oil that is setting new records for all-round protection and economy on many leading U.S. railroads.

Here's why:

1. Chosen for their ability to prevent hard carbon deposits in hot spots, the selected base stocks of Dieselmotive oil also provide an oxidation resistance safety factor.
2. 100% solvent refining of base stocks (which removes undesirable constituents) guarantees greater stability and more effective bearing protection.
3. Superior additive response is obtained by carefully matching the additives to the base stocks. This insures clean rings and grooves, a minimum of piston crown deposits.

All these quality features add up to a tough filmed, heavy duty detergent oil that delivers benefits like these: Cleaner engines, less wear, greater economy, and higher availability.

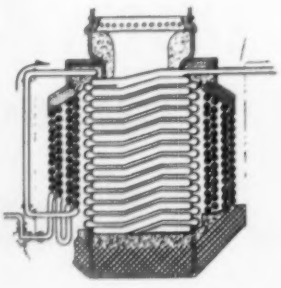
Ask a Gulf Sales Engineer to recommend the proper grade of this outstanding lubricating oil for your diesels. Consult the telephone directory for the number of your nearest Gulf office. Or write to Gulf Oil Corporation · Gulf Refining Company, 1822 Gulf Building, Pittsburgh 30, Pa.



GULF

THE FINEST PETROLEUM PRODUCTS FOR ALL YOUR NEEDS

Pennsalt PM-90 Steam-Generator Descaler now shipped in this non-breakable, lightweight plastic container



INHIBITED-ACID ACTION makes PM-90 gentle to boiler tubes while efficient in dissolving calcium and magnesium deposits. PM-90 won't erode or embrittle the metal.

Be sure of really safe, fast monthly washout of diesel steam-generator boilers with Pennsalt PM-90® inhibited-acid descaler! This accurately-balanced, concentrated cleaner is safe to the delicate metal surfaces of boiler tubes, yet thorough in removal of baked-on water scale. Long known and used in unhandy glass carboys by railroad maintenance men, PM-90 is now shipped in non-breakable plastic-lined steel drums—and thus freight savings and complete safety in handling are added to the advantages of PM-90 as a boiler cleaner.

New container saves freight, space, time . . . The new polyethylene-lined drums are one-third the weight of glass carboys, take up half the space. Because they're available from four widely-dispersed shipping points, and because their safety and compactness put them in the lowest ICC classification, your freight costs are substantially reduced. These rugged drums can be stacked to the ceiling of your warehouse or to the top of a freight car, and handling a full drum is a one-man job. Each drum has standard plugs and can be equipped with spouts for convenient use of PM-90.

Ask your Pennsalt man . . . Your Pennsalt Railroad Maintenance Specialist will gladly demonstrate PM-90 for you. Call him today, or write Metal Processing Dept. 275 Pennsylvania Salt Manufacturing Company. East: Three Penn Center Plaza, Philadelphia 2, Pa.; West: 2020 Milvia Street, Berkeley 4, Calif. In Canada: Pennsalt Chemicals of Canada, Hamilton, Ontario.

Pennsalt Chemicals

"PLYPAK SAVES US PLENTY!"

(36-month repack saves money, too)

Application of Plypak to railway journals saves on repairs and delays. (5-year Plypak service record shows more than 80% reduction in hot boxes) Plypak also saves on waste (40%). Added to these savings is the fact that, on request to the A.A.R., Plypak may go 36 months without repacking . . . a big saving in labor, oil, and waste.

UNLIMITED A.A.R. APPROVAL

The PLYPAK has A.A.R. approval for unlimited application in interchange for those roads desiring its use—protected in interchange. See rule 101

PLYPAK

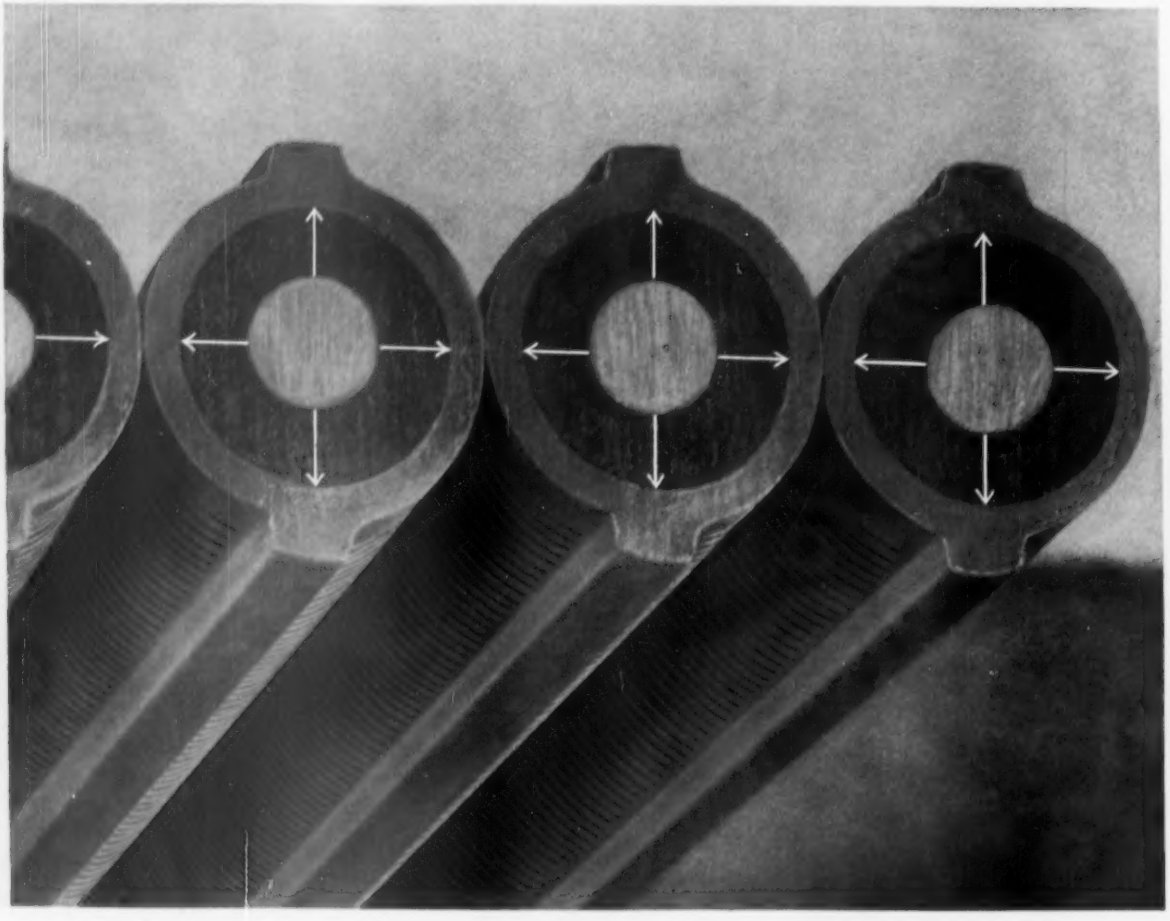
WASTE CONTAINER AND RETAINER

WAUGH EQUIPMENT COMPANY

New York, Chicago, St. Louis. Canadian Waugh Equipment Company, Ltd., Montreal

EXIDE-IRONCLAD BATTERIES

For railway car lighting and air conditioning



Power tubes expand without shedding — preserve battery life

BATTERY FOR RAILWAY CAR LIGHTING AND AIR CONDITIONING. Model EHL. Write for Bulletin No. 5168.

Every time you discharge a storage battery, the active material on the positive plates expands. But the plate grids don't expand. This is basic.

On most batteries, the expanding active material tends to shear off from the nonexpanding grid every time the action takes place. But this can't happen in the Exide-Ironclad Battery. The reason is simple.

Active material is formed concentrically around the spinelike grid and held inside the plastic tubes. Expansion is predominantly in an outward direction—hence no shearing. Active material remains firmly locked to the underlying grid structure. And the flexible plastic tubes yield and take up as needed.

This extra protection against shedding of active material is only one of the many reasons for the long life of Exide-Ironclad Batteries. When you order heavy duty batteries, or the equipment requiring them, be sure to specify Exide-Ironclad. Write for detailed bulletin. Exide Industrial Division, The Electric Storage Battery Company, Philadelphia 2, Pa.

Exide®

The Engineer's Report

CASE HISTORY
RPM Delo Oil R.R.
LUBRICANT

Western Pacific R.R. Co.
FIRM

Special oil maintains high average mileage record!

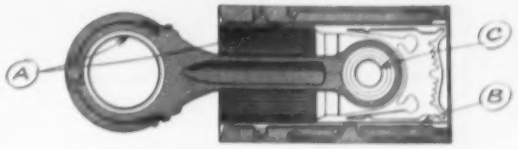
1776 CYLINDER ASSEMBLIES make up the 111 diesels in road freight service on the Western Pacific R.R. These units, as well as all passenger locomotives on the line, are lubricated with RPM DELO Oil R.R. Maintenance records of several years on freight locomotives show following average actual miles on parts removed for any reason: wristpins and bushings, 413,675 miles; pistons, 376,018 miles; liners, 354,101 miles. A representative assembly is shown in insert, just as it appeared after 476,497 actual freight miles. Note cleanliness of parts and free rings—typical of Western Pacific's experience with RPM DELO Oil R.R., the standard on the line since 1949.

FOR MORE INFORMATION about petroleum products of any kind or the name of your distributor, write or call any of the companies listed below.

RPM DELO LUBRICATING OILS

TRADEMARK "RPM DELO" REG. U. S. PAT. OFF.

How RPM DELO Oil R.R. prevents wear, corrosion, oxidation



A. Special additive provides metal-adhesion qualities...keeps oil on parts whether hot or cold, running or idle.

B. Anti-oxidant resists deterioration of oil and formation of lacquer...prevents ring-sticking. Detergent keeps parts clean...helps prevent scuffing of cylinder walls.

C. Special compounds stop corrosion of any bushing or bearing metals and foaming in crankcase.

STANDARD OIL COMPANY OF CALIFORNIA, San Francisco 20 • STANDARD OIL COMPANY OF TEXAS, El Paso
THE CALIFORNIA OIL COMPANY, Perth Amboy, New Jersey • THE CALIFORNIA COMPANY, Denver 1, Colorado

New Look for *El Capitan*

Passengers will soon find even greater comforts and attractions on Santa Fe's El Capitan. For years this luxurious all-chair train between Chicago and the West Coast has been a favorite with the traveling public. Now the proud train is to have a new look, and the look is more than skin-deep. It's all the way through.

Outstanding feature of the new El Capitan will be ultramodern two-level cars built by the Budd Company of Philadelphia. The consist of each train will be seven chair cars, with all seats on the upper level; a diner with the entire upper deck devoted to table space; and a dome-type lounge car that offers unlimited panoramic views of the landscape. All cars are fifteen feet, six inches high — two feet higher than conventional equipment.

Among the basic items of running-gear are Bethlehem wrought-steel wheels and forged-steel axles. Needless to say, these Bethlehem products are fashioned to the highest standards of workmanship; they are worthy components, like everything else in the cars. We at Bethlehem are happy indeed at this association with El Capitan, a famous train, and with the Budd Company, master carbuilders.

BETHLEHEM STEEL

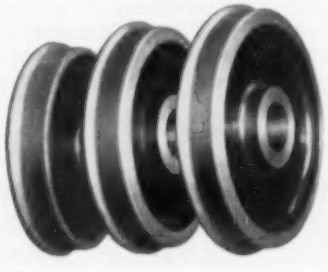
BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM WROUGHT-STEEL WHEELS

COMPANIONS TO BETHLEHEM FORGED-STEEL AXLES

FREIGHT • PASSENGER • DIESEL

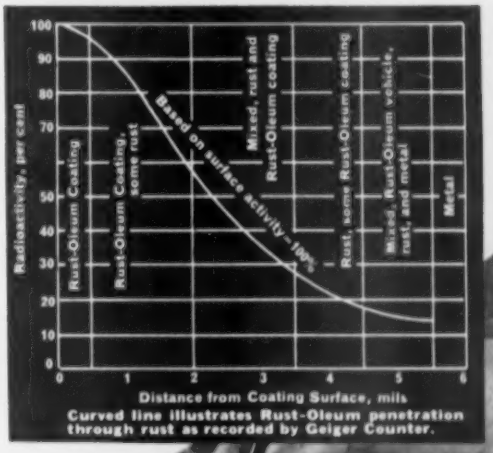


RUST-OLEUM®

PENETRATION

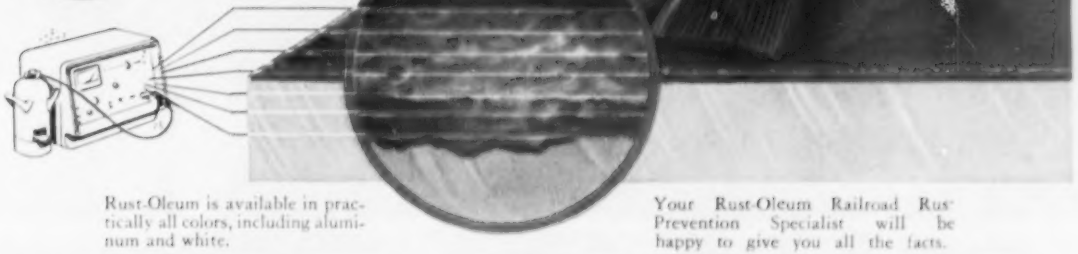
through rust to bare metal traced by Geiger Counter. To effectively stop rust—the vehicle of a protective coating, when applied over a sound, rusted surface—must penetrate through the rust down to bare metal. **Rust-Oleum does exactly that!—as proved by radioactive research!** Rust-Oleum's specially-processed fish oil vehicle was radio-activated and formulated into Rust-Oleum 769 Damp-Proof Red Primer—then applied to rusted test panels. Penetration *through rust* to bare metal by Rust-Oleum's specially-processed fish oil vehicle was then traced by Geiger Counter.

You stop rust, because Rust-Oleum's fish oil vehicle soaks deep down to bare metal and into the tiny pits where it drives out air and moisture that cause rust. You save, because this same *penetration* enables you to apply Rust-Oleum directly over rusted surfaces—usually eliminating costly surface preparations. Attach coupon to your letterhead for your thirty-page report entitled, "The Development of a Method To Determine The Degree of Penetration of a Rust-Oleum Fish-Oil-Based Coating Into Rust On Steel Specimens," prepared by Battelle Memorial Institute technologists.



Curved line illustrates Rust-Oleum penetration through rust as recorded by Geiger Counter.

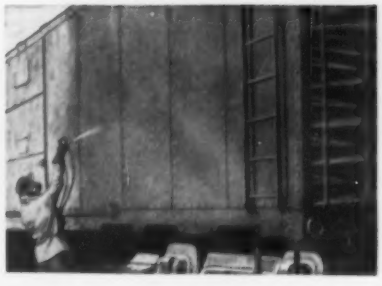
There is only one Rust-Oleum. It is distinctive as your own fingerprint. Accept no substitute. Buy—and specify only Rust-Oleum. You'll be happy that you did.



Rust-Oleum is available in practically all colors, including aluminum and white.

Your Rust-Oleum Railroad Rust Prevention Specialist will be happy to give you all the facts.

RUST-OLEUM®



STOPS RUST!

ATTACH TO YOUR LETTERHEAD—MAIL TODAY

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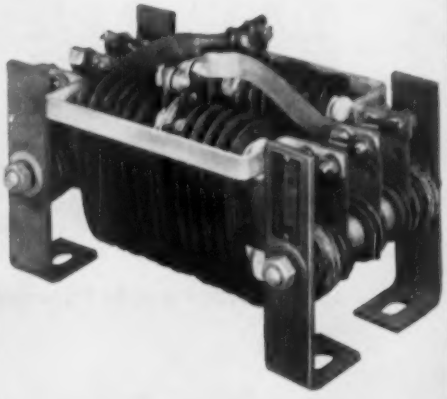

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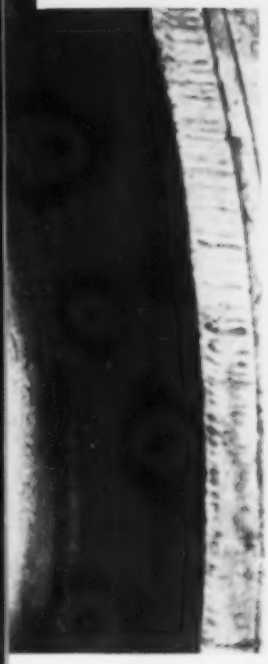
1. G-E RECOMMENDED CARBON BRUSHES are ideal for your replacement needs. Selected for the proper degree of hardness and grain structure to resist breakage and minimize wear on commutator surfaces, they have the riding qualities required to maintain a good surface film on the commutator.



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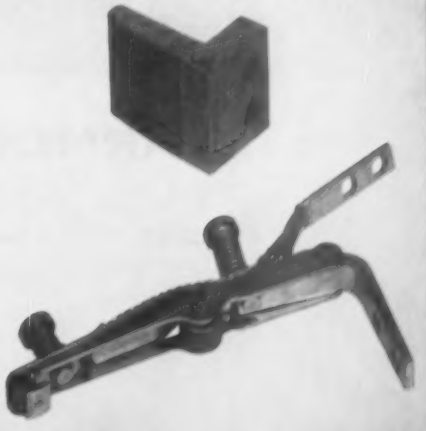

For proof of wheel performance

LOOK UNDER YOUR CARS

Stamped on the back of the rim of each Armco One-Wear Wrought Steel Wheel you'll find the date it was made. Check this date for proof of service.

Most Armco One-Wear Wrought Steel Wheels deliver more than 15 years of normal service. Many serve much longer. Want proof? *Just look under your cars.*

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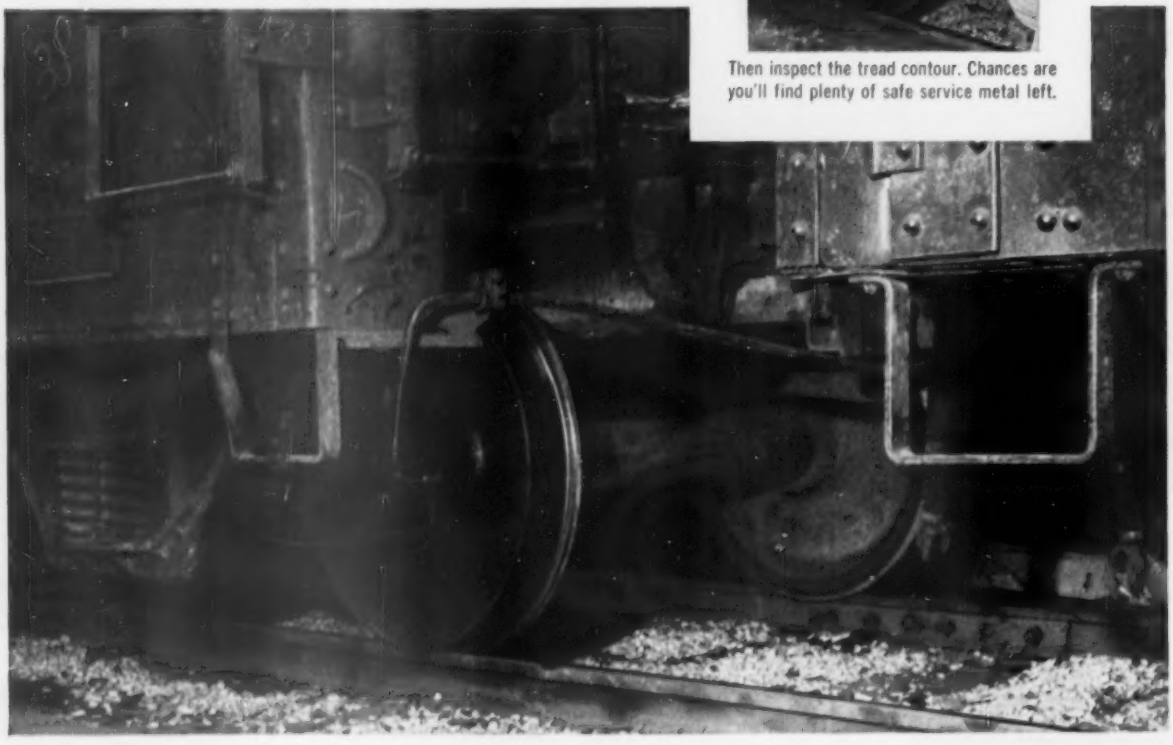
Only forged and rolled wheels stretch your wheel dollars over so many service miles. But extra service life isn't all you get with Armco One-Wear Wrought Steel Wheels. They're tough—safe and dependable. They need practically no maintenance. Freight moves fast and shippers stay happy. What's more, a slid-flat can often be machined out and the wheel returned to service.

For more information about service-proved Armco One-Wear Wrought Steel Wheels, contact our nearest sales office or write us at the address below.

Then inspect the tread contour. Chances are you'll find plenty of safe service metal left.



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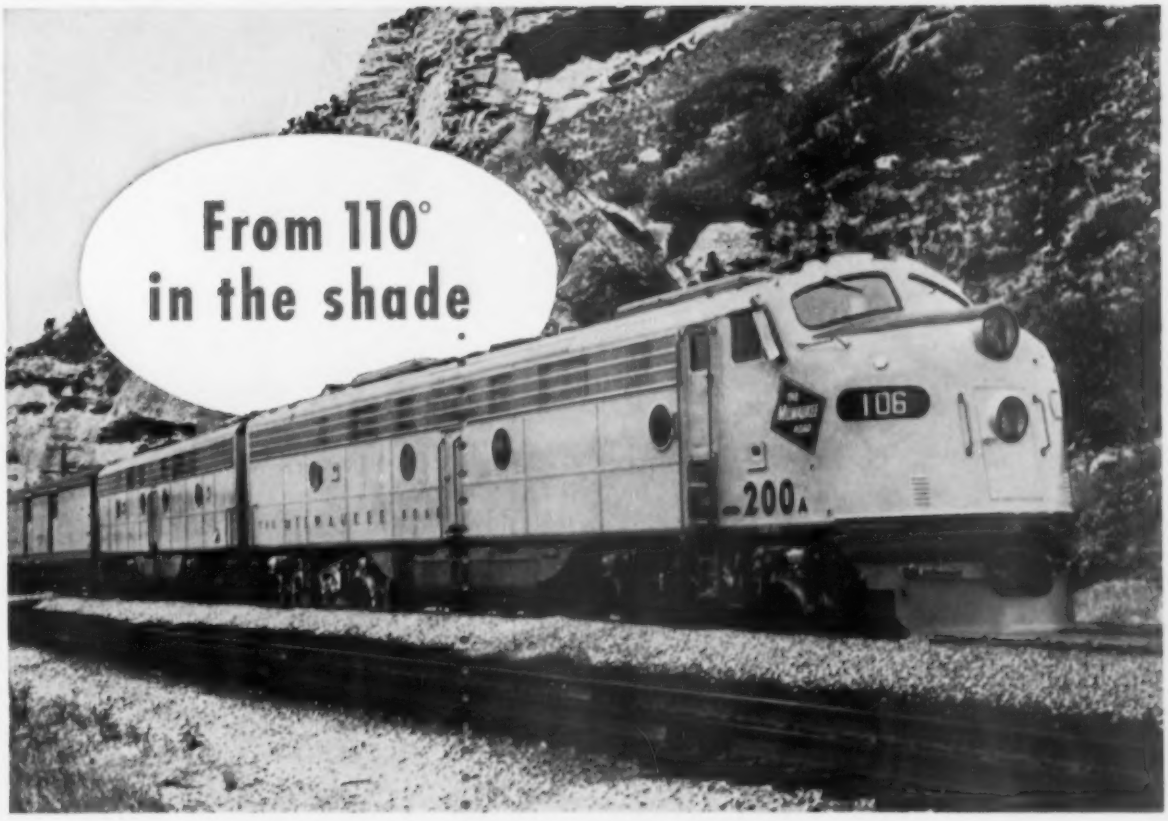

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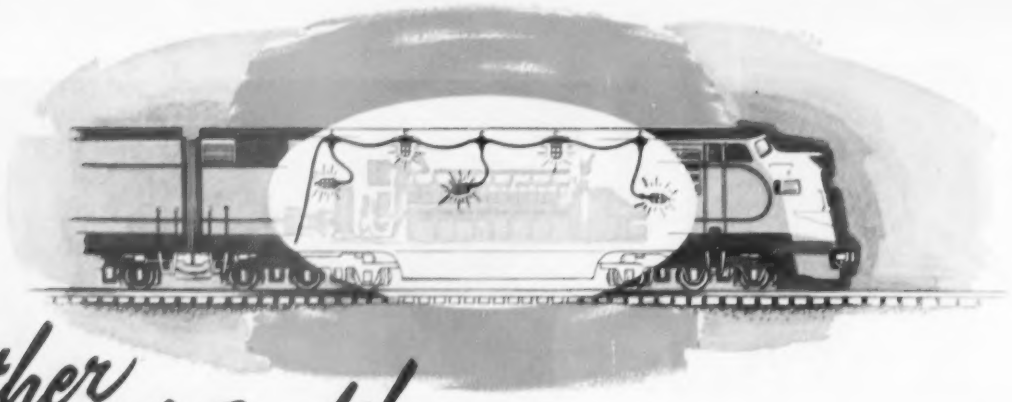

Another JOY *First!*

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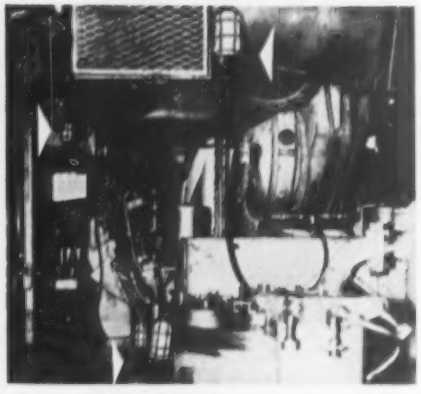
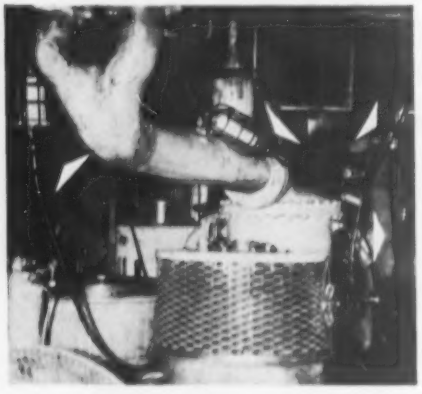


Left side of Diesel Engine showing overhead portable lights and handlamps.



Right side of Diesel Engine showing overhead portable lights and handlamps.

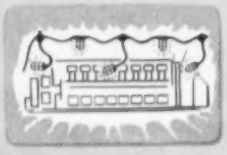
At last . . . a practical answer to the electrical power and lighting needs of Diesel maintenance work. Provides up to 1000 watts of illumination and six correctly spaced electrical outlets for hand held power tools, around each engine. Eliminates battery drain and prolongs battery life because current used is provided from an external 110 volt A. C. power source. Each assembly is made up of the following one-piece molded Neoprene/rubber sections that interconnect quickly to meet any lighting or power outlet need. (1) MAIN LIGHT STRING . . . hangs over aisle along one side of engine. Has two 100 watt Vapor-proof light fixtures and three evenly spaced power outlets. (2) HANDLAMP EXTENSION (Vapor-proof) . . . Plugs into power outlets in main light string. (3) POWER EXTENSION . . . 50 feet over-all. Connects to outside 110 volt A. C. power. Has 3-way female plug for power distribution within Diesel Engine. Why light up Diesels with "candle power" now that proper working illumination is so economically available? Ask us for complete details.

Check These Advantages

Eliminates drain on batteries. Uses 110 V current from external electrical source.

Provides up to 1000 watts of light for each Diesel engine being serviced.

Safe, Vapor-proof handlamp extensions plug into power outlets in main light string.



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EDITORIALS . . . . . .

Not As Bad As We Thought

Back in March we had a few words to say about some of the difficulties that the railroads are having in hiring and keeping good technical men and we rather anticipated that on a subject as important as this there would be opinions expressed on both sides of the house. We must confess, however, that the volume of the response was *not* anticipated.

We've received so many letters that we had to build a new "house" to put them in and so we introduce to you, our readers, a new department which we've labeled "Readers' Laments and Cheers" which appears this month on page 4.

If you think letters such as these do not create some impact on railroad managements you're wrong for among the few we have room for this time are some expressions from management. What they really bring out is that many railroads are making a real effort to make railroad careers for young men attractive enough to interest the right men and to demonstrate to these men that they can do as well, in the long run, in the railroad industry as they may be able to do elsewhere. They also bring out, in forceful manner, the things that the railroad industry is going to have to change in order to keep some of these men. It is significant that the salary scale is not the factor in most cases that turns the tide against the railroad for they do about as well in this respect as many other industries.

If you who have not expressed your opinion have any fuel to "add to the fire," let's have it. Conditions are rarely ever changed by keeping silent.

It Isn't so Technical— Just Electrical

The average mechanical man who looks into the back of a television sees only a mass of wires and little gadgets —a meaningless confusion. But it can't be as complicated as it looks or boys without a college education couldn't fix them.

Diesel locomotives are a lot less complex than television sets, and slowly but surely, railroad operators are learning what to do with them. If a man understands a piece of equipment, he will like it, and if he likes it, it will work even if it isn't top quality. Conversely, if he doesn't like it, it won't work no matter how good it is.

There are many ways of learning about things electrical, but for a good thorough going education in electrical railroad practices, there is probably nothing so all inclusive or more valuable than the reports of the Electrical Section, AAR. Anyone who familiarizes himself with them, and better still, who works as a member of one of its committees, will not only get to know what it is all about, but he will get to like it and since there are not enough good electrical men in railroad service, his chances for a better job are good. A job you like is worth more than almost anything else you can have. True, railroad service is exacting and at times trying, but so is anything else worth while, and there is a good place for the electrical man who wants to come up from the bottom.

Action Reaffirmed

Loose journal box packing may be nearing the "end of the road." AAR Mechanical Division action, while far from unanimous, was that of a majority. Probably many of the negative votes on this matter were cast because of the effective dates and not because the car owners felt that performance would be impaired with new lubricating devices. This was brought out at the discussion in the Mechanical Division annual meeting when one railroad's representative stated that, despite their negative vote, they felt there was already factual data available showing improved performance. He went on to emphasize that our present "standard" isn't good enough for present day operations.

The Chicago meeting gave an opportunity for healthy discussion of both sides of an issue which can potentially cost or conserve millions of dollars. Because of the far-reaching impact, discussion and decision affecting journal lubrication must have the benefit of every possible fact and experience. Performance, standards and maintenance policies must be firmly established before there is any mandatory action which ultimately could affect over 1.5 million existing freight cars.

Both sides of this vital issue were heard in Chicago. Both were able to present extensive arguments. Final action could only reaffirm what had already been reached by orderly democratic action. How and when loose waste will be eliminated may not be established—but there is the general principle that it is on its way out.

What Are Your Ideas?

"What design of freight car, or combination of car and 'container' " do you suggest to "save time and money for shippers and receivers," etc.? Your ideas may be worth $1,000 if you will follow the instructions on page 96 of this issue. This prize, and a second of $250, is being offered by Joseph T. Small, an analyst of railroad securities for a New York firm. The Executive Editor of the *Railway Age* is in charge of the contest. September 30 is the deadline.

For Quickest Action in Cutting Metal and Costs

NEW CINCINNATI HIGH POWER and DUAL POWER DIAL TYPE MILLING MACHINES

Primarily, you're cutting costs when you step up cubic removal of metal. And you have plenty of opportunity to remove metal as rapidly as the work and fixture will permit when you assign the job to a new CINCINNATI® High Power or Dual Power Dial Type Milling Machine. These new knee types are tops in cutting capacity; tops in easy, convenient operator control; tops in low maintenance expenses. You'll be interested in the "vital statistics" shown in the table below. ¶Cost-reducing possibilities of the High Power and Dual Power Dial Types include 24 spindle speeds . . . 32 feeds (⅜ to 90 ipm) . . . full power to the spindle with independent feed drive motor . . . single lever, power selection of speeds and feeds. Horizontal machines are equipped with Dynapoise overarms to reduce self-excited chatter . . . plain and vertical machines are equipped with automatic table cycles. Write for new catalog No. M-1917-1; or look in Sweet's for brief data.

THE CINCINNATI MILLING MACHINE CO.
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A high cubic removal job (1¼" depth of cut, 19 ipm feed) . . . milling the sides of heavy machine tool part on a new CINCINNATI® No. 5 Plain Dual Power Dial Type Milling Machine.

Power draw-bar attachment reduces the cost of this 12-operation job on No. 4 Vertical Machine.

Sizes	No. 3	No. 4	No. 5	No. 6
Styles	Plain Univ. Vert.	Plain Univ. Vert.	Plain *Univ. Vert.	Plain Vert.
Table travel	34"	42"	50"	60"
Motor drives: Spindle (H.P.) (D.P.)	 20 hp 30 hp	 25 hp 50 hp	 25 hp 50 hp	 25 hp 50 hp

*No. 5 Universal available in High Power Machine only

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MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING MACHINES • METAL FORMING MACHINES • FLAME HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

Budd Coach Cuts Weights and Costs

An economical passenger car for commuting and medium distance services—orginal project assignment for the Budd engineering department—has proved so satisfactory in a series of road and laboratory tests that it is now offered for any type of passenger operation. Although designed to be used in lower mileage services in which profits are not now possible because of the operating and fixed costs of present-day standard equipment, the car has also been arranged for typical long-distance accommodations.

The car was developed to be suitable for general use without a wholesale revolution in railroad operating practices. It has AAR tight lock couplers at standard coupling height. It also complies with AAR and ICC strength and safety requirements. The Budd position is that the 85-ft car permits the greatest economies in structural materials and construction costs.

Shorter bodies, according to Budd, introduce a weight penalty because of the larger number of car ends.

For riding qualities and safety, this builder has retained the four-wheel truck although its design has been radically changed and its weight reduced to 6,300 lb. The head end electrical power, which Budd first used on the early Burlington Zephyrs and which has recently been accepted by more and more railroads, was utilized to reduce weight, first cost and operating expenses.

The finished car is not a completely independent unit because of the need for head-end power and because of the "LWE" brake equipment. However, few of the recently built railroad passenger train designs have been governed by requirements of complete interchangeability.

Truck Completely New

In designing this new truck, the structural goals were low weight without sacrifice of strength, simplicity of fabrication, and ease of maintenance. Dynamically, Budd's aim was to provide a level, safe and quiet ride under all road conditions and loadings. The mechanical design, frequent use of new materials, and utilization of air spring suspension have been the Budd methods of achieving these aims.

The low truck weight was achieved by making the load paths from the carbody to the wheels as direct as possible to reduce bending moments. Such parts as the equalizer beams and swing hangers are eliminated. Body loads are transmitted by the air springs directly to the truck bolster at a point near the side sills. Result is an extremely light body bolster.

Vertical loads then go from the truck bolster to the side frames throught side bearings with nonmetallic bearing surfaces. The truck side frame then carries the load directly into the inboard journal bearings.

With these inboard bearings, a shorter, lighter axle has been used. The car has 30-in. wrought steel wheels.

The grease-lubricated Timken roller bearings have their inner races mounted on the tubular axle and the outer races carried in rubber bushings clamped in split rings, which are the ends of the side frames. Rubber mounting is to insure uniform bearing loading, and the serrated split arrangement makes it possible to change wheel sets. The side frames are hollow beams of deep,

oval cross section assembled from two stampings welded together.

Integral with each side frame is a triangular structure terminating in a half bearing at the central pivot attached to the bolster beam. This allows independent vertical motion of the two side frames to allow the truck to negotiate vertical irregularities in the rail. The truck is maintained in tram by the central pivot which prevents longitudinal displacement of the side frames and resists lateral thrusts while allowing the truck to rotate under the bolster.

The bolster beam is hollow and is used as an air reservoir for the air springs. Rotation of the bolster is prevented by rubber-mounted anchor bars extending to the side sills. These links also transmit braking forces into the car body. Both lateral and vertical bolster movement is possible, but lateral is finally limited by rubber-cushioned bumpers. A new Budd disc brake is mounted outboard of the wheel, and both the disc and the operating mechanism can be readily removed.

Metallic wearing surfaces in the truck are completely eliminated and moving parts are isolated by rubber bushings, brake lining material, and wear-resistant plastics. These innovations, along with the arrangement of parts, are intended to simplify maintenance and reduce costs. In combination with air springs, the non-metallic mountings isolate the body from external vibration and noise.

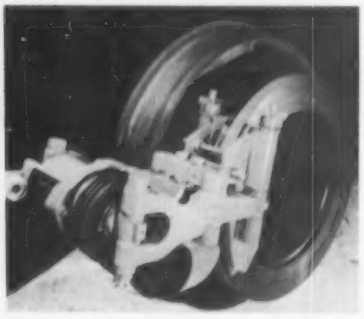
The air springs work in conjunction with the reservoir formed by the hollow bolster beam to produce a unique dynamic system. At the bottom of each air spring is an orifice which opens into the hollow bolster. Produced is a spring with a variable spring rate and built-in damping that varies according to the frequency and displacement of the air springs. The single spring acts as a stiff undamped spring to cushion jars caused by rail joints and as a soft spring with high damping to smooth out track irregularities.

The result was produced after a study using the analog computer at Franklin Institute which indicated the proper spring volume, reservoir volume and orifice diameter. Tests have shown that the result produces a ride superior to the standard equalized truck with the conventional double spring system such as used under the Budd RDC cars. Because the two air springs are connected through the bolster reservoir, there is considerably less resistance to side lean than in the conventional truck. However, the lower weight of the car, and the smaller moment arm through which this weight acts on the truck, have yielded a car in which lean is considerably less than that of conventional coaches on the same curves.

The same ride is provided under all loadings by holding the static height of the car constant with a leveling valve attached to the center of the bolster and to the body. Changes of air pressure in the spring system are made only with changes in static load because the valve acts only if the center of the normal vertical oscillation changes. This same leveling system is utilized to adjust the cylinder pressure in the brake system and make braking force proportional to car weight. Lateral oscillation is damped with two specially designed Houdaille shock absorbers, and truck shimmy is damped out by friction introduced at the side bearing.

The body is a welded, high-tensile, stainless-steel structure combining standard Budd practices with some used by their European licensees and

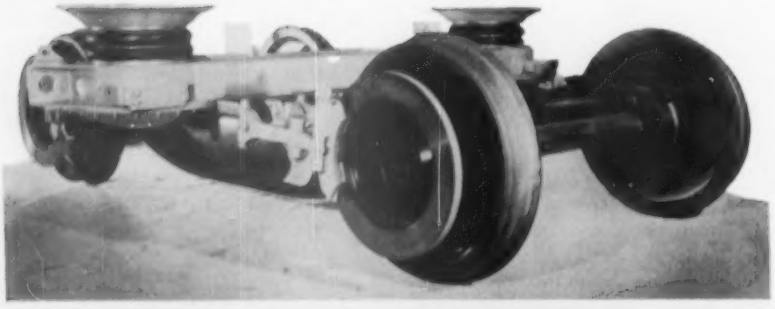
NEW AIR SPRING TRUCK

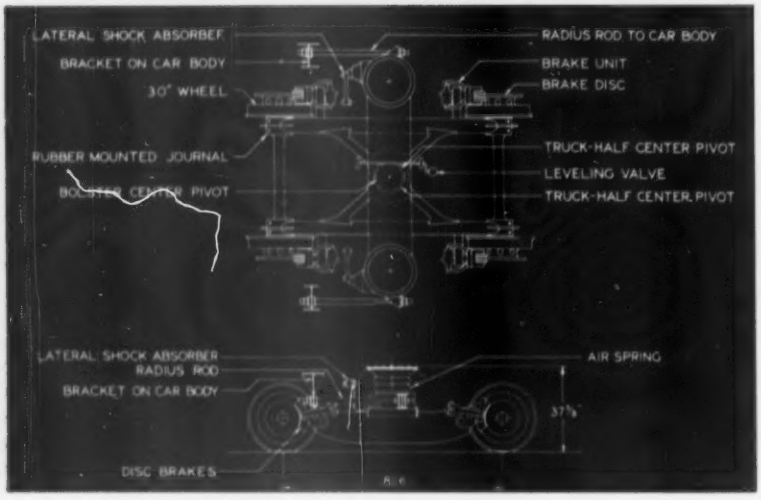


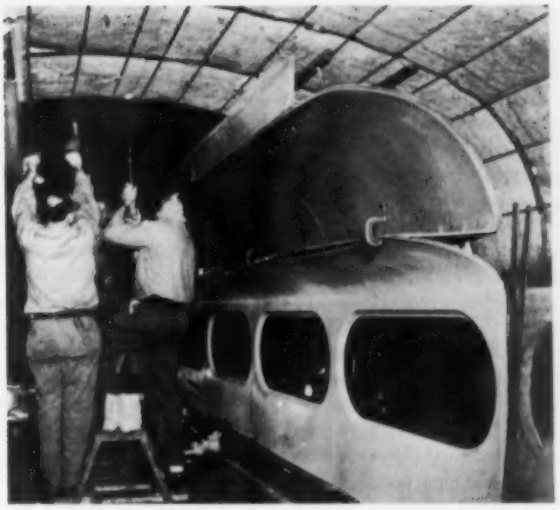
Outboard disc brake can be removed as a unit, clamps on both sides of single solid brake disc.

Assembled truck (center) is built up of welded subassemblies. Air springs fit into top of bolster.

Bolster (below) does not swivel, but radius rods and shock absorbers allow vertical and lateral motion.







Two-piece side lining and similar simple air duct construction are intended to simplify construction and maintenance. Inside width is 9-ft 5¼-in., car's interior height is conventional.

High lighting level and colorful plastic walls should attract passengers; ease of cleaning and repair are intended to appeal to potential railroad owners. Other seating can be utilized.

with a new underframe construction. A divided center sill composed of two stainless Z-shaped members is connected directly to the collision posts at the ends. A lightweight welded alloy draft gear pocket braces the end of the car, carries the draft gear and coupler, and reinforces the joints between center sills and the collision posts. The widely spaced center sills give direct support to the seat pedestals.

The two center sills are connected by corrugated stainless steel which stabilizes their flanges and gives a housing for the electrical lines under the car. The floor sheathing is corrugated stainless steel. Cross bearers support the center sills vertically, and the construction at the light body bolster provides the pockets into which the air springs fit.

Corrugated stainless steel is used for the load-carrying exterior side paneling of the body. The nodes are polished for appearance. The corrugations are directly welded to vertical posts at each pier panel and to intermediate stub posts providing extra stiffness. Stamped pier panels combine stiffness and lightweight without further reinforcement, and serve to inset the rubber window mountings.

The pier panels are connected to the roof at a joint which provides a strong rail to resist sideswiping loads. The structure is simplified by the absence of a letter board. The corrugated roof is welded directly to Z-shaped carlines. Corrugated panels are used at the ends of the car and for the vestibule partition.

One-piece, round-cornered frames are used at the side doorways and at the air conditioning equipment openings to reinforce the structure, which would otherwise be weakened because the car's low profile causes the openings to occupy an unusual portion of the car height. The body and truck designs allow a floor height of 39-in. and a platform height of 43¼-in. This platform is one step lower than the standard, and a ramp inside at each end of the car brings the passenger down to the coach section floor level. The low platform is possible because a specially shaped diaphragm plate is supported and pivoted directly on the coupler. This allows not only two cars of this design to operate together, but permits the car to be coupled with standard equipment.

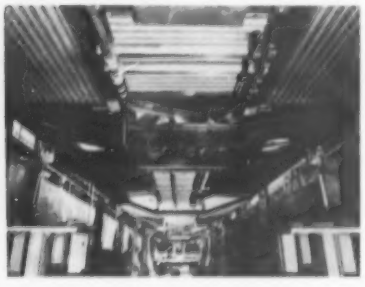
Isocyanate Foam

The space above the corrugated floor sheathing and below the plywood floor is filled with isocyanate foam generated in place. This supports both floor and sheathing, and provides insulation and sound deadening. End step wells are each single-piece molded plastic units which incorporate light weight, high strength and integral color. The underbody battery boxes are produced in the same way.

These external components and most of the interior finish of the new "Pioneer" are made of laminated, fiberglass—reinforced plastic which has been under development by Budd for some time. This strong, lightweight material can be molded to any desired shape, allowing one-piece designs eliminating supporting structure and joints while giving an easily cleaned, better appearing surface. Each bay (single window span) in the coach section is lined with one panel extending from the heater guard to the nose edge of the luggage rack—including the window trim and lower baggage racks surface. A second panel combines the upper surface of the baggage rack, the ceiling, and half the air duct. The panels are connected between each window with a single extruded aluminum moulding. Fiberglass insulation is used behind the panels.

The desired color is built into the panels and no painting is required, thus contributing substantially to lower maintenance costs. The hard wearing surface will resist normal surface scuffing. Should repairs be required, they can be made in place or the entire panel can be replaced. In the washrooms, a single reinforced plastic piece combines the outer wall lining with the hopper and wash basin enclosures and provides for towel disposal, lights, towel dispenser and mirror. Both the hopper and washbasin are formed of fiberglass and are quickly removed

Wide-spaced center sills and corrugated floor strengthen 85-ft 2-in. length of car. Collision posts are fastened to sills directly. Overall height of car is 11-ft 6-in.; truck centers 59-ft 6-in.



Underbody construction has corrugated cover plates over sills and tubular crossties. Floor height is 39-in.; platforms are 43¼-in.

from the plastic enclosure. This entire assembly is mounted in the car as a unit, prepiped and prewired.

Interior partitions are of micarta-faced plywood. The safety glass windows have their upper areas deeply tinted so that no shades are required. They are glazed directly into the openings with rubber mouldings. The 100-gal laminated-plastic water tank is located overhead above the lavatories so that no anti-freeze protection will be required. Vinyl plastic, non-corrosive piping is used which will not burst if it should freeze. Thermostatically controlled electric heaters supply hot water in each washroom.

The air duct is covered by unit light panels projecting downward to provide a slot for air distribution. These panels mount a double row of 60-in. fluorescent tubes with starters and wiring. The panels are faced with sheets of silvered "mylar" making high efficiency reflection behind the tubes. The light fixtures are corrugated, translucent polyester plastic strips held in place by vinyl-covered metal bands. A light level of nearly 40 ft candles is provided at the reading plane. Other formed laminated plastic units used on the car are vestibule ceiling panels, exterior skirts, luggage shelves and the seats.

Semi-bucket Seats

Seats on the Pioneer III are fixed, semi-bucket type with heat-sealed vinyl-foam cushioned upholstery developed especially for the car by U. S. Rubber. Strength of the single-piece, moulded, glass-reinforced, double plastic seat is provided by the shape. It is mounted on an aluminum tube base welded to cast aluminum wall bracket and seat pedestal. The upholstery is easily removed and replaced. The complete assembly of this type weighs 50 lb. The car could be equipped with any type of seating desired by the railroad.

Head-end power for this car can come from a locomotive with auxiliary power plants, or from a power car similarly equipped. A part of a power car could serve as a baggage car. Train lines for 440-v, 60 cycle, 3-phase a-c. A control line would open a breaker on the power source before the jumpers between cars are separated. Also the control system provides for serial starting of air conditioning equipment. In each coach locker is a dry rectifier for charging the 32-v storage battery which supplies d-c for incandescent lighting at platforms, passageways and washrooms, and for car emergency lighting.

At the vestibule end of the car there is an enlarged entrance aisle. On one side are luggage shelves and water cooler. Air conditioning equipment and electric lockers are on the opposite side. These passage walls are of fluted, stainless-faced plymetal.

The air conditioning cabinet has the compressor and condenser housed in its lower part. Condenser and fan are mounted to swing out from an opening in the side of the car for maintenance or replacement. The opening then gives access to the high-speed, sealed, Safety-Carrier compressor and its induction motor which are track-mounted so they can be brought out for easy exchange. Flexible metallic hoses are extensively used, and the entire compartment is lined with plastic and separated from the car's interior paneling with sound-deadening isofoam.

Fresh and recirculated air are separately filtered and mixed in a plenum before passing through the track-mounted evaporator which is installed like the compressor for easy maintenance. Refrigerant piping has been brought to a minimum, increasing efficiency and simplifying maintenance. Air is drawn through the filters and evaporator by a single large blower and delivered through a transition duct to the center-ceiling duct for distribution. Heating is supplied by steam train line, and is distributed to the overhead and floor systems through modified Vapor Unizone controls.

The New York LWE electro-pneumatic, straight air system is used with the Budd-designed variable load attachment previously discussed. Control of maximum brake cylinder pressures is particularly important in a light weight car where load variations are great. The e-p control gives instant application on all cars of a consist, and is followed up by a straight air application through the pneumatic system. These cars cannot be train lined with conventional equipment having automatic brakes for regular service, although Budd "Pioneers" could be equipped with any style of brakes. The LWE brakes will respond only to an emergency application of automatic equipment.

The car and its components have undergone a lengthy series of laboratory tests, as well as tests in actual service to determine riding qualities, braking efficiency, and noise level. Budd, satisfied that "Pioneer III" more than fills its original assignment as a suburban service unit, is now offering it for all types of railroad passenger applications.

Budd has already completed preliminary designs for typical main line equipment. These include an interchangeable 88-passenger coach weighing an estimated 61,000 lb, and a 52-passenger coach just 1,000 lb heavier. Other completed designs include the diner, bar lounge, and sleeper. The predicted weight of the sleeping car is 79,000 lb which would be the same as that estimated for the "Pioneer III" electric m-u car—another possible car arrangement which Budd has also designed.

Economics of Freight Car Roller Bearings

The abstract of the economic study on the use of roller bearings on freight cars which appears on this and the following pages is, in reality a sequel to the first economic study which was presented before the Railroad Division of the American Society of Mechanical Engineers at the 1951 Annual Meeting. This 1956 study, which is now available to those interested, brings the statistics up to date and offers some interesting and valuable data with respect to the problem of railway car bearing applications and maintenance. The original study appeared in *Railway Locomotives & Cars*, January 1952, p. 43 and February 1952, p. 67 as well as in *Railway Age* for December 31, 1951, p. 37 and January 7 1952, p. 63.

In compiling this study and cost analysis, all previous studies and source material available have been explored to arrive at conservative conclusions. A particular effort has been made to avoid assumptions and to use supported data where available.

To establish the maximum savings resulting from roller bearings, this study is based on the premise that all freight cars in the United States will be equipped with roller bearings. If both roller bearings and friction bearings were used, some of the savings would be lost in perpetuating present friction bearing maintenance facilities along with certain new roller bearing facilities. During the transition period when cars were being equipped with roller bearings, it would of course be necessary to have maintenance facilities for both types of journal bearings. However, a decision to use roller bearings on all cars would permit gradual depletion of friction bearing stocks and maintenance facilities while roller bearing facilities were being increased, much the same as the changeover made from steam to diesel locomotives.

If only a few railroads were to completely equip their cars with roller bearings, incomplete benefits would be obtained, since the equipment of other railroads not using roller bearings would continue to be handled in

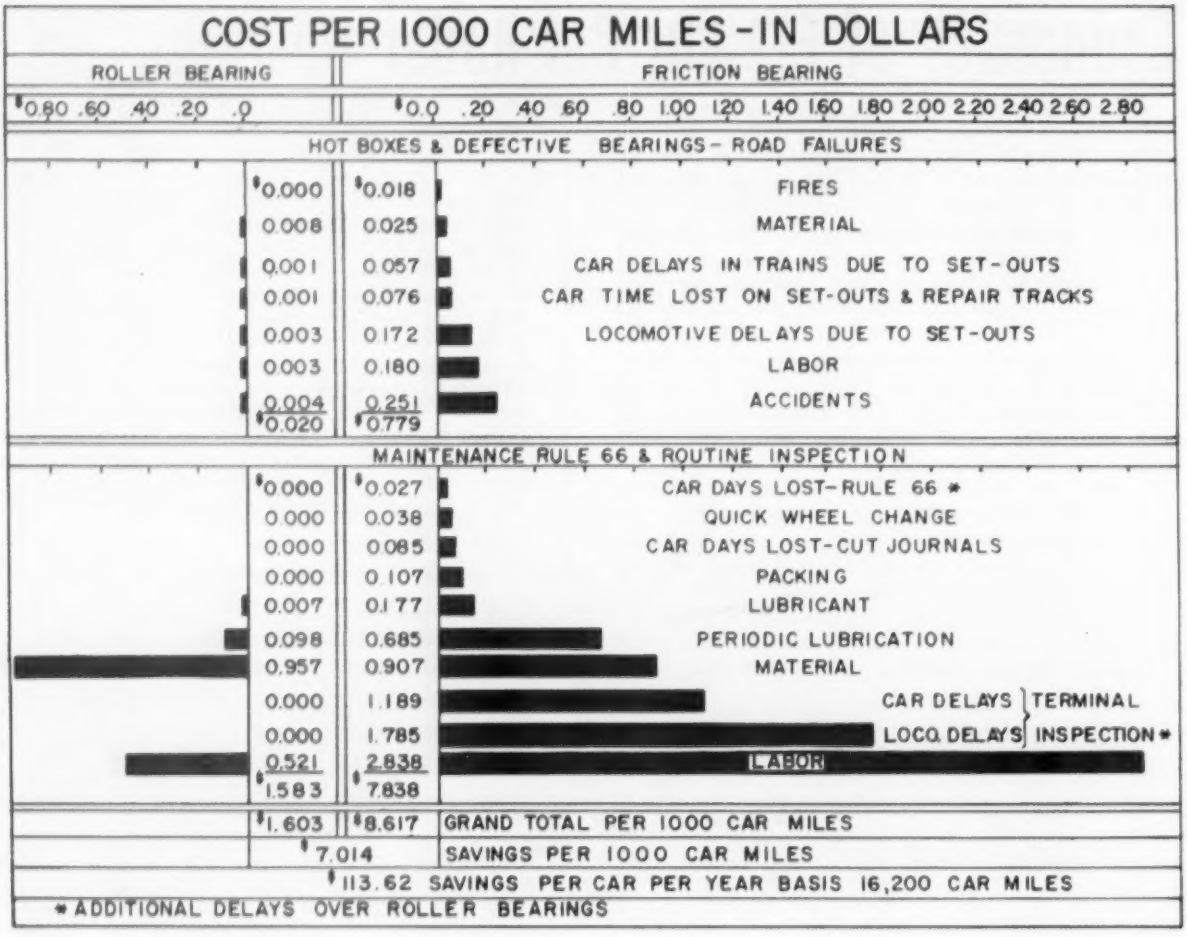
RETURN ON INVESTMENT REQUIRED FOR ROLLER BEARINGS

Application	Roller Bearing Savings† Annually Per Car	Additional Investment Over Friction Bearings Per Car	Return Based on Accounting Method‡	Return Based on Discounted Cash Flow or Investor's Method	
				Assuming No Delay Between Purchase Date and Revenue Service Date	Assuming 3 Months Delay Between Purchase Date and Revenue Service Date
To new cars $650.00 price*	$113.62	$571.32	19.9%	19.8%	18.9%
To existing cars $650.00 price*	$113.62	$596.07	19.1%	19.0%	18.1%
To new cars $560.00 price*	$115.20	$481.32	23.9%	23.9%	22.6%
To existing cars $560.00 price*	$115.20	$506.07	22.8%	22.7%	21.5%

*$650.00 is the selling price per car set in effect during the first half of 1955 for the Timken heavy duty, type AP (all-purpose) 5½"x10" freight car application. The price included the wedge suitable for the integral box or the new narrow pedestal jaw-type frames. The $560.00 is the price estimated during the same period on a basis of production of 50,000 car sets per year over a ten-year period.

†These savings are based on prices and costs in effect during the first half of 1955. Subsequent labor cost inflation further increased the savings advantage of roller bearings because of the predominance of labor in the operation and maintenance of friction bearings.

‡Based on the average saving per year divided by the original investment. One of the common accounting conventions for computing the return is the ratio of the project's earnings averaged over its life divided by the average lifetime investment. Since the average lifetime investment is considered to be only about 50% of the original outlay, the per cent return figures would be twice those shown in this column under this convention.


COST PER 1000 CAR MILES - IN DOLLARS
ROLLER BEARING
FRICTION BEARING
$0.80 .60 .40 .20 .0
$0.0 .20 .40 .60 .80 1.00 1.20 1.40 1.60 1.80 2.00 2.20 2.40 2.60 2.80
HOT BOXES & DEFECTIVE BEARINGS - ROAD FAILURES
$0.000 $0.018 FIRES
0.008 0.025 MATERIAL
0.001 0.057 CAR DELAYS IN TRAINS DUE TO SET-OUTS
0.001 0.076 CAR TIME LOST ON SET-OUTS & REPAIR TRACKS
0.003 0.172 LOCOMOTIVE DELAYS DUE TO SET-OUTS
0.003 0.180 LABOR
0.004 0.251 ACCIDENTS
$0.020 $0.779
MAINTENANCE RULE 66 & ROUTINE INSPECTION
$0.000 $0.027 CAR DAYS LOST - RULE 66 *
0.000 0.038 QUICK WHEEL CHANGE
0.000 0.085 CAR DAYS LOST - CUT JOURNALS
0.000 0.107 PACKING
0.007 0.177 LUBRICANT
0.098 0.685 PERIODIC LUBRICATION
0.957 0.907 MATERIAL
0.000 1.189 CAR DELAYS } TERMINAL
0.000 1.785 LOCO. DELAYS } INSPECTION *
0.521 2.838 LABOR
$1.583 $7.838
$1.603 $8.617 GRAND TOTAL PER 1000 CAR MILES
$7.014 SAVINGS PER 1000 CAR MILES
$113.62 SAVINGS PER CAR PER YEAR BASIS 16,200 CAR MILES
* ADDITIONAL DELAYS OVER ROLLER BEARINGS

interchange. Facilities for both types of bearings would have to be maintained permanently. The data in this study is therefore based on the assumption that all railroads will have roller bearings on all freight cars.

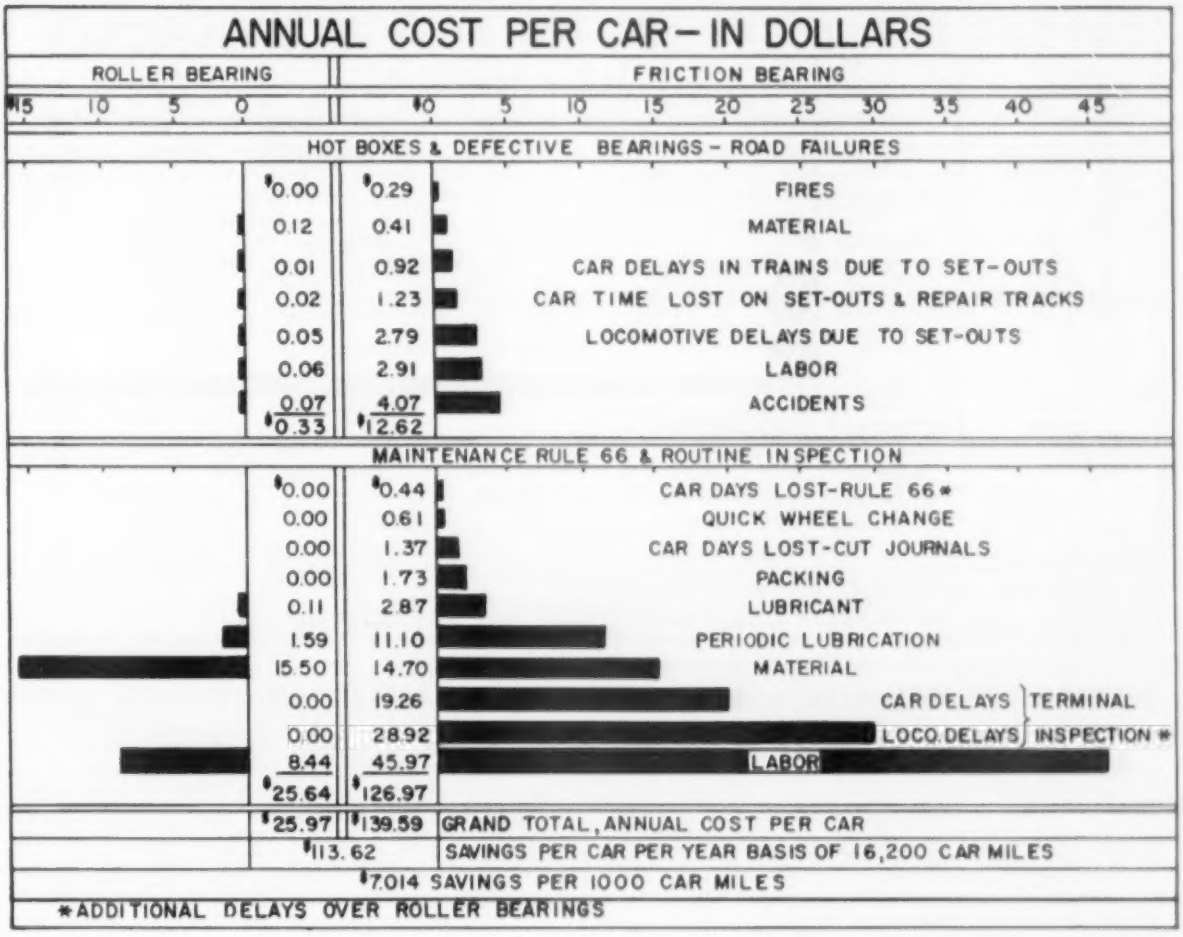
In order completely to equip all freight cars with roller bearings, private car line equipment must be included. The handling railroad is responsible for all damage due to hot boxes and performs all inspection and lubrication over its lines on all cars without charge to the car owner, except repacks and periodic lubrication attention for which a charge is made. Since these constitute the largest items of expense involved in maintaining journal boxes, the advantage of roller bearings is of primary interest to the handling railroad. A decision by the railroads to make the journal roller bearing a required standard, would necessitate that some agreement be reached with private car lines to insure application of roller bearings.

The cost of journal bearings varies with the size of the journal. Since a majority of the freight cars in the United States have 5½-in. x 10-in. bearings, the costs on this size bearing are used throughout the study in order to simplify the calculation procedures. Since the number of cars with journals smaller and larger than the 5½-in. x 10-in. size tend to average the costs, an average figure per car makes this report easier for individual railroads to analyze than if an attempt were made to arrive at costs for each size bearing. Railroads having a high percentage of equipment with larger than 5½-in. x 10-in. journals should specially analyze the factors presented by such a ratio of ownership in considering the data of this report.

An annual average of 16,200 miles per car is used in this study in the determination of certain data requiring the use of car mileage. This mileage is based on the ARCI 1953 figure of 44.3 car-miles per day.

Savings Claimed from the Use of Roller Bearings

- Lower hot box rate.
- Lower bearing failure rate.
- Lower maintenance cost.
- Increased car availability and reduced car ownership.
- Quick wheel change saving with pedestal type side frames.
- Saving in locomotive hours.
- Better safety record (less accidents and no fires).
- Reduced switching costs.
- Reduced locomotive fuel costs.
- Elimination of tonnage reductions in cold weather due to friction bearing characteristics.
- Less loss and damage to lading.
- Reduced draft gear and coupler maintenance.
- Centralized wheel and axle shops.
- Better relationship with shippers.
- Fewer schedule delays.
- Higher speed operation and decreased scheduled terminal layovers.
- Decreased dead weight.
- Reduced wheel slip.


ANNUAL COST PER CAR – IN DOLLARS
ROLLER BEARING
FRICTION BEARING
15 10 5 0
0 5 10 15 20 25 30 35 40 45
HOT BOXES & DEFECTIVE BEARINGS – ROAD FAILURES
$0.00 $0.29 FIRES
0.12 0.41 MATERIAL
0.01 0.92 CAR DELAYS IN TRAINS DUE TO SET-OUTS
0.02 1.23 CAR TIME LOST ON SET-OUTS & REPAIR TRACKS
0.05 2.79 LOCOMOTIVE DELAYS DUE TO SET-OUTS
0.06 2.91 LABOR
0.07 4.07 ACCIDENTS
$0.33 $12.62
MAINTENANCE RULE 66 & ROUTINE INSPECTION
$0.00 $0.44 CAR DAYS LOST-RULE 66*
0.00 0.61 QUICK WHEEL CHANGE
0.00 1.37 CAR DAYS LOST-CUT JOURNALS
0.00 1.73 PACKING
0.11 2.87 LUBRICANT
1.59 11.10 PERIODIC LUBRICATION
15.50 14.70 MATERIAL
0.00 19.26 CAR DELAYS TERMINAL
0.00 28.92 LOCO. DELAYS INSPECTION*
8.44 45.97 LABOR
$25.64 $126.97
$25.97 $139.59 GRAND TOTAL, ANNUAL COST PER CAR
$113.62 SAVINGS PER CAR PER YEAR BASIS OF 16,200 CAR MILES
$7.014 SAVINGS PER 1000 CAR MILES
*ADDITIONAL DELAYS OVER ROLLER BEARINGS

Although all of the above items are of economic importance, savings have been included in this study for only the first seven items. Difficulty in assigning dollar values to the remaining items has prevented their inclusion in the calculations. Some of these items are discussed in the pages immediately following.

The AAR annual hot box statistics show a friction bearing hot box mileage of 247,932 car miles per hot box for 1954. This figure has been used to compute the friction bearing costs. It considers only those hot boxes set out "between division terminals." The validity of the improvement shown over the past several years may be questionable because of changing interpretations of the loosely defined term "between division terminals." Recent emphasis on the improvement of friction bearing performance has made all concerned very interested in showing improvement in hot box statistics within any one railroad or in competition between roads. Some of the improvement shown may be a result of varying interpretations of what constitutes a hot box between division terminals.

Obviously, any improvement in hot box mileage has required expanded maintenance effort and/or improved materials, controls or lubrication devices. Although the study includes the benefits of the better hot box showing by using the latest available hot box statistics, no additional expense has been included for its attainment. For instance only $0.045 per lb. for packing and $0.49 each for spring retainers are included in the friction bearing costs. One of the cheaper special packs costs about $35.00 per car set, while other lubricators cost $200.00 and more per car set. It is not known what added expense the new "controlled bearing clearance" system involves.

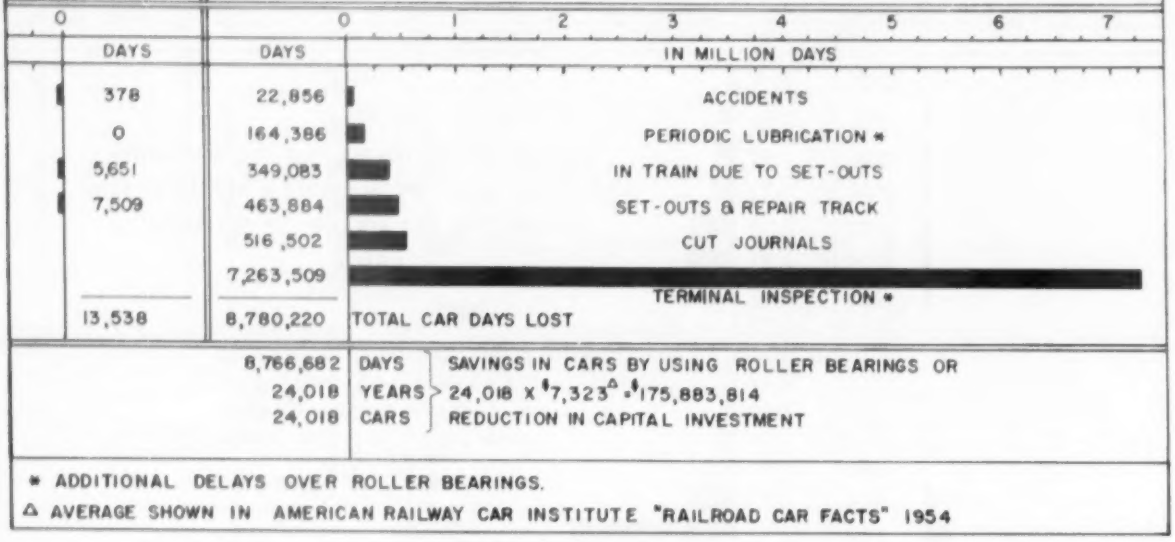
Hot Box Frequency With Roller Bearings

Over a period dating back to 1927, a group of 600 passenger cars equipped with Timken roller bearings has produced a performance record of one hot box per 17,800,000 car miles. This figure includes all hot boxes and not just those counted when the car is set off "between division terminals" as defined in the AAR monthly statistics for freight cars. Passenger car experience indicates that not more than 1 out of 4 hot boxes could be classed as set-out "between division terminals." Therefore, the hot box performance for passenger car bearings becomes:

17,800,000 × 4 = 71,200,000 car miles per passenger car hot box set out "between division terminals," on the same basis as AAR monthly statistics for freight cars.

The freight car roller bearing is of lighter capacity than the passengar car roller bearing which is fully justied as shown later on in this study. However, it is sometimes argued that a lower hot box rate should be estimated for freight cars than passenger cars. It should be

CAR DAYS LOST DUE TO BEARING FAILURE OR IN INSPECTION



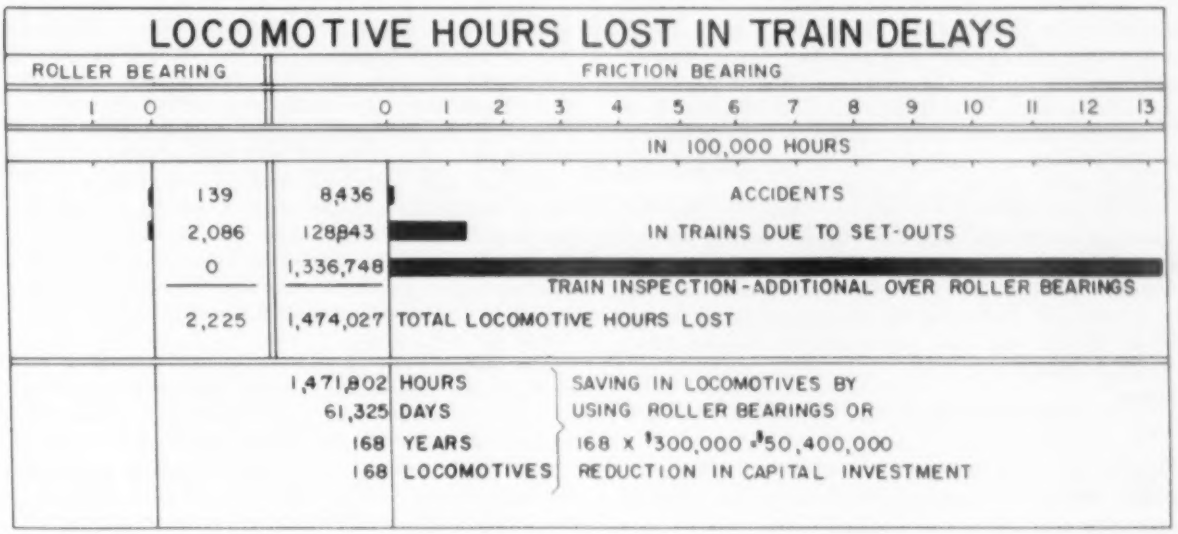
* ADDITIONAL DELAYS OVER ROLLER BEARINGS.

△ AVERAGE SHOWN IN AMERICAN RAILWAY CAR INSTITUTE "RAILROAD CAR FACTS" 1954

SUMMARY OF ESTIMATED ANNUAL LABOR AND MATERIAL MAINTENANCE COSTS

Item No.	Description of Items	All Freight Cars Equipped with: Friction Bearings — Total Annual Cost*	Friction Bearings — Annual Cost* Per Car	Friction Bearings — Cost* Per 1,000 Car Miles	Roller Bearings — Total Annual Cost*	Roller Bearings — Annual Cost* Per Car	Roller Bearings — Cost* Per 1,000 Car Miles
1.	Repairing Hot Box Set Outs	$ 16,279,553.31	$ 8.26	$0.510	$ 491,943.09	$ 0.25	$0.015
2.	Damage to Equipment - Overheated Journals Broken	8,024,639.49	4.07	0.251	132,569.08	0.07	0.004
3.	Fires Due to Hot Boxes	577,167.00	0.29	0.018	0.00	0.00	0.000
4.	Cut Journals Found During Routine Inspection and Periodical Repacking	8,937,206.27	4.53	0.280	...	...	...
5.	Defective Bearings Found During Routine Inspection Other than Wheel Renewal and Periodical Repacking	5,913,560.29	3.00	0.185	...	...	...
6.	Periodical Lubrication Per AAR Interchange Rules 66 and 66-A	21,887,793.85	11.10	0.685	3,141,195.28	1.59	0.098
7.	LABOR - Not Included in Items Above:						
	A. Routine Transportation Yard Inspections and Service Attention	80,490,194.87	40.82	2.520	11,664,693.60	5.91	0.365
	B. Cleaning and Repacking Journal Boxes - Wheel Defect Removals	1,788,319.80	0.91	0.056	...	...	...
	C. Applying Spring Packing Retainers	170,337.20	0.08	0.005	...	...	...
	D. Turning Journals - Wheel Defect Removals	1,451,215.71	0.74	0.046	0.00	0.00	0.000
	E. Nine-Year Roller Bearing Inspection	...	...	...	4,983,319.60	2.53	0.156
8.	MATERIAL - Not Included in Items Above:						
	A. Defective Bearing Replacements	11,623,941.84	5.90	0.364	19,166,613.86	9.72	0.600
	B. New Axles (Replacements)	6,612,481.77	3.35	0.207	8,145,810.88	4.13	0.255
	C. Journal Box Oil	5,667,195.14	2.87	0.177	...	...	...
	D. Prepared Packing	3,412,333.65	1.73	0.107	...	...	...
	E. Journal Box Lids	2,952,115.00	1.50	0.092	...	...	...
	F. Spring Packing Retainers	909,770.99	0.46	0.028	...	...	...
	G. Journal Bearing Wedges	589,114.76	0.30	0.018	...	...	...
	H. Journal Box Dust Guards	511,737.26	0.26	0.016	...	...	...
	I. Journal Box Dust Guard Plugs and Cement	80,800.62	0.04	0.003	...	...	...
	J. Solvent	85,893.50	0.04	0.003	159,721.78	0.09	0.005
	K. Journal Coating	31,991.52	0.02	0.001	...	...	...
	L. Coolant	175,693.96	0.09	0.006	...	...	...
	M. Roller Bearing Grease	...	...	...	216,902.18	0.11	0.007
GRAND TOTALS		$178,173,057.80	$90.36	$5.578	$48,102,769.35	$24.39	$1.505
	Total Annual Difference Additional Savings				130,070,288.45	65.97	4.073
	Car Time				38,847,889.67	19.70	1.216
	Locomotive Time				57,025,669.28	28.92	1.785
	Quick Wheel Change				1,209,346.42	0.61	0.038
	Total Annual Savings				$227,151,193.82	$115.20	$7.112

*Costs are based on 31,944,356,429 total freight car mileage for year 1954, as shown in AAR Annual Hot Box Statistics, and an average of 16,200 miles per year for freight cars.


LOCOMOTIVE HOURS LOST IN TRAIN DELAYS
ROLLER BEARING
FRICTION BEARING
1 0
0 1 2 3 4 5 6 7 8 9 10 11 12 13
IN 100,000 HOURS
139 8,436 ACCIDENTS
2,086 128,843 IN TRAINS DUE TO SET-OUTS
0 1,336,748 TRAIN INSPECTION - ADDITIONAL OVER ROLLER BEARINGS
2,225 1,474,027 TOTAL LOCOMOTIVE HOURS LOST
1,471,802 HOURS
61,325 DAYS
168 YEARS
168 LOCOMOTIVES
SAVING IN LOCOMOTIVES BY USING ROLLER BEARINGS OR
168 x $300,000 = $50,400,000
REDUCTION IN CAPITAL INVESTMENT

understood, however, that many—and perhaps even a majority—of the roller bearing hot boxes occur irrespective of bearing size. Records show that about 50% of the hot boxes are caused by low oil or other inadequate maintenance, which failures would occur without relation to bearing fatigue.

Conservatively, it is estimated that the roller bearing equipped freight car hot box rate will not exceed one in 15,000,000 miles using the AAR basis of reporting hot boxes "between division terminals." Present freight car experience is already much better than this figure.

Using a hot box rate for freight cars of one in 15,000,000, then:

$$\frac{16,200}{15,000,000} = 0.00108 \text{ hot boxes per year per car for freight car roller bearings.}$$

Complete development of the bearing life, load and mileage relationship between freight and passenger cars is shown later in this study.

Hot Box Frequency With Friction Bearings

Using the 1954 average car mileage of 247,932 per hot box set-out "between division terminals" for all railroads reporting to the AAR, the annual hot box rate is:

$$\frac{16,200}{247,932} = 0.0654 \text{ hot boxes per car per year for friction bearings.}$$

The figure of 0.0654 hot boxes is about 60 times higher than the estimated figure for roller bearings. By comparison, it would be expected that only one hot box would be experienced with roller bearings for every 60 hot boxes with friction bearings.

[1] $\frac{16,200 \text{ mi/yr - freight}}{78,700 \text{ mi/yr - passenger}} \times 100 = 20.58\%$

The 78,700 mi/yr for passenger cars is obtained from data in ICC Statement No. M-213 (OS-B) for United States 1953 - Passenger Train Car Miles; and, ARCI "Railroad Car Facts," Car Building and Car Repairing 1954, page 60, 1953 Passenger Cars.

The various railroad roller bearing manufacturers, at the request of the AAR, have studied the problem of the bearing replacement rate for freight car roller bearings. These manufacturers have agreed that with an annual mileage of 17,000, there may be up to 2% average replacements per year for all causes over a 30-year car life. At an annual mileage of 16,200, as used in this study, bearing replacement figure then becomes 1.9%. The total replacement rate per car per year as used in this study is: 8 bearings per car $\times$ 1.9% = 0.152 bearings per car per year.

In determining a bearing replacement rate for freight car roller bearings, extensive passenger car, locomotive, and freight car roller bearing performance experience was reviewed to arrive at a sound, conservative figure. For a car life of 30 years, 2% average replacements per year over the 30-year life indicates an average bearing life of 25 years, which is considered very conservative. There is every reason to believe that average bearing life will exceed this figure.

The AAR Study states that in a test on a large railroad, 13,000 passenger car roller bearings of three principal bearing manufacturers required 4,231 replacements or 32.5% in 25 years of service, indicating an annual average repair replacement of 1.3%. By the use of proper modifying factors, this figure can be developed into an estimated freight car average replacement per year value.

Here are some of the factors which may be considered in correlating passenger and freight car bearing life:

- About one half of the freight car mileage is with the car empty and the balance is with partial to full journal load capacity. Passenger cars are almost constantly loaded to passenger journal capacity.
- Annual freight car mileage is only about 20% of passenger car mileage based on national averages.
- Smaller bearing used for freight cars has lower capacity.
- Reduced operating speed for freight cars. This favorable factor for freight cars largely cancels the following unfavorable factors:
- Greater car coupling impacts with freight cars.
  a. Stiffer freight car springs.
  b. Less favorable track conditions (very minor because most roads use the same track interchangeably for freight and passenger traffic.
  c. Superior wheel maintenance on passenger cars.
- Greater car coupling impacts with freight cars.

No data are available with which to develop a modifica-

tion factor for Items 4 and 5 above. These are relatively insignificant life factors which may be ignored. Items 1 and 3 may be combined by calulations. Modern passenger car roller bearings have a theoretical life of about 4 to 5 times the freight car bearing theoretical life under their respective loading conditions. An average ratio of 4.5 times is used in the following calculations.

The remaining Item 2 correlates yearly mileages for passenger and freight cars. The national average passenger car annual mileage, mentioned previously, is 78,700. Although there is reason to believe that annual mileage is considerably higher on the test railroad, the lower figure will be used here, and an annual mileage ratio results as follows:

$\frac{78,700}{16,200} = 4.86$ ratio of passenger car annual mileage over freight car annual mileage.

These factors can then be used to modify the 1.3% repair replacements per year average found on the test railroad:

$\frac{1.3\% \times 4.5}{4.86} = 1.2\%$ indicated annual average replacement for freight car roller bearings.

The 1.2% figure confirms that the 2% replacement per year over a 30-year car life for an annual mileage of 17,000 is a conservative one. It allows a considerable compensation for adverse factors to freight car bearing operation.

A friction bearing usage for 1954 of 6,003,883 friction bearings is shown in Appendix L, page 94 of the complete study. The following calculations give the years' life per friction bearing.

Total car miles[2] for 1954 · 31,944,356,429

$$\text{Number of cars} = \frac{31,944,356,429}{16,200} = 1,971,874$$

$\frac{1,971,874 \times 8}{6,003,883} = 2.6275$ years per friction bearing replacement.

Stated another way, the car mile usage per friction bearing replacement is:

$\frac{31,944,356,429}{6,003,883} = 5,321$ car miles per friction bearing replacement.

Refer to the charts analyzing bearing costs on pages 54 and 55. Note that friction bearing labor is the largest single expense item. Here the friction bearing labor cost of $45.97 annually, not including labor under rule 66, is 5.4 times the roller bearing labor cost of $8.44.

Another large item of friction bearing maintenance expense is the delay caused to cars and locomotives for terminal inspections, totalling $48.18 annually over and above roller bearing equipped car expense for this item.

The grand total friction bearing cost per year of $139.59 is 537% of the roller bearing cost of $25.97.

Increased availability of freight cars equipped with roller bearings is obtained as follows:

- Car time saved at inspection points.
- Car time saved by reduced road delays.
- Car time saved on journal maintenance and periodic inspection.
- Higher speed of operation.
- No tonnage reductions in cold weather due to characteristics of friction bearings.

It is axiomatic that anything which will increase the availability of equipment increases the potential work output of that equipment. In the case of railroad equipment, this is illustrated very forcefully in the dieselization program. Consistently, a lesser number of diesel locomotives has been used to replace large numbers of steam locomotives. One of the large factors making this possible is the increased availability of the diesel locomotive.

The increased freight car availability can be used in one of two ways: (1) the car fleet can be reduced in size to perform the work volume now produced by friction bearing cars, or (2) the existing car fleet can be maintained and the increased availability used to recapture much traffic now lost to other forms of transportation due to car shortages.

The railroads cannot properly operate without a reserve of cars. They must, on the average, have a surplus of cars in order to meet peak demands. However, the greater availability of roller bearing equipped cars means that the same peak carloading demands can be met with fewer cars. Even if availability were only increased 5%, this would be the equivalent of reducing car ownership by about 100,000 cars; or would provide this many more cars to recapture business lost because of car shortages.

Car Time Saved With Roller Bearings

The estimated time saving per terminal inspection is 2.51 minutes per car. Actually this is the amount of inspector's time saved per car but, the reduction in delay to the train and each individual car is the product of the time saved per car by the number of cars covered by each inspector. For instance, an average train of 65 cars would ordinarily be covered by four inspectors. This means each man must inspect the equivalent of 16.25 cars (actually one side of 32.5 cars). The time saved per car per terminal then becomes:

$16.25 \times 2.51 = 40.787$ minutes per car per terminal.

Since there are 130 separate inspections per year per car the car time saved per year is:

$40.787 \times 130 = 5,302$ min per car per year.

A formula is introduced in Appendix G (of the complete study), which places a day value on a freight car in keeping with the revenue value of the car. Car shortages and surpluses and the per diem value of the car are included in the calculations arriving at a freight car's day value. By the use of this formula the average car day value is calculated to be $5.23 per day over the 10-year period 1946-1955. The dollar savings in inspection time can be computed as follows:

$\frac{5302}{60 \times 24} \times 5.23 = \$19.26$ saving per car per year.

Inclusion of the savings figure in this analysis is logical and justified because the car time saved increases the car availability for additional revenue service.

Greater availability cannot always be employed automatically, but often requires changes in methods, facilities, work forces, and schedules. Other inspection and servicing, such as that for locomotives, will have to be arranged to fit the new availability of the roller bearing equipped freight train. However, the savings present with roller bearing cars offer an attractive incentive to make changes as necesary to fully utilize the increased availability of this equipment.

[2] AAR Report GC 1061, Stencil 5196-2.

Mechanical Division Told Car Improvements Are Needed

Annual meeting at Chicago, in addition to the routine business of the division, has opportunity to hear about the equipment changes that future traffic demands dictate

"We in the railroad industry believe that we have every right to assume that rail traffic will increase in relationship to increased production and the necessity for increased transportation. However, there are factors which must be evaluated and conditions which must be corrected if we are to retain even the present percentage of the total intercity freight traffic. If service is one of the factors which influences traffic it should be corrected within the industry and perhaps to a large extent by corrective actions of individual railroads." This statement was made by R. G. May, vice-president, operations and maintenance AAR while setting forth problems facing the mechanical departments, as viewed from "headquarters" during an address at the 1956 annual meeting of the Association of American Railroads, Mechanical Division, held June 25 to 27 incl. at the Hotel Sherman, Chicago. The attendance at the meeting, including those attending the Electrical Section was approximately 1,800 members, guests and supply men.

In continuing, Mr. May said in part that, "Service not only applies to maintaining dependable freight train schedules but providing an adequate and well-maintained fleet of freight carrying cars to meet shipper requirements. The proper maintenance of motive power and cars so as to provide a satisfactory service is generally accepted as the responsibility of the mechanical officer. The adequacy of the fleet is of economic consideration and involves many factors which must be considered at the executive level.

"The fleet of general service cars has decreased from 1,776,000 in 1953 to 1,700,000 at the end of 1955. The member roads of the Association were aware of the seriousness of the situation during the early spring and a special meeting was called in Chicago on June 24, 1955. An average daily shortage of 22,659 cars was reported for the last week in October, at which time loadings reached their highest point for the year. The trend at the present time is upward in ownership of cars and it is gratifying to note that we have now reached the goal of 4 per cent of bad order cars. There are presently 120,000 new cars on order and it is anticipated that deliveries will reach more than 6,000 cars during the month of June.

"The increased ownership, together with the reduction in bad order cars which will add considerably to the fleet of serviceable cars, should help alleviate some of the problems as we approach the heavy carloading periods of the early fall of this year. Increased utilization of the present fleet of freight carrying cars is another means by which we can reduce shortages during the peak loading season. Studies have been made by appropriate committees of the Operating-Transportation Division and recommendations made regarding operating practices, modification of demurrage tariffs and other items which they believe will increase the availability of cars. The Bureau of Safety and Service, I.C.C., has also considered the necessity of increased utilization of freight cars and service orders are now in effect covering the movement of cars by carriers, reduction of free time on export and import unloadings and loadings, and routing of shipments."

President J. P. Kiley of the Milwaukee paid tribute to maintenance men by describing some recent accomplishments in his mechanical department. Noteworthy among these is a 50-ft box car with 30-ft side door openings, using the underframe of a heavy duty flat car. Modifying some 50-ton box cars with roof hatches and small doors which swing out at the sides to facilitate handling wood chips is another project, while under investigation is a 50-ft box car with 20-ft side doors in diagonally opposite corners.

Cabooses built on the underframes of old steam locomotive tenders is another Milwaukee Road practice. In the diesel department the Milwaukee has cut the average cost of truing a pair of diesel wheels from $80 to $8, a sizeable saving where 160 pairs of wheels need truing each month.

Mr. Kiley told how the increased size of industrial organizations and the upgrading of the labor force brings the need for better communication between employees and all levels of management. Today a single individual may be operating a device worth thousands of dollars and under these circumstances an order that is only half understood or an ignorance of the purpose of the work can lead to disastrous mistakes. Much work is furthermore of a highly technical nature which requires good understanding between the worker and the supervisor to be properly executed.

The president of the Milwaukee also told of a Wisconsin company's experience with what was termed "participative management," i.e., letting employees in on what is going on and inviting them to contribute ideas to the solution of problems involving their work. Following this employee participation, loyalty and cooperation was improved, output increased and additional talent

D. S. NEUHART
Chairman

C. E. POND
Vice-Chairman

W. M. KELLER
Executive Vice-Chairman
Director of Research

F. PERONTO
Secretary

OFFICERS AND GENERAL COMMITTEE MEMBERS

Five new general committee members were elected for two-year terms, as done each year, and two new officers were elected, as done each even year. C. E. Pond, general superintendent motive power, N&W, becomes chairman of the Mechanical Division, while J. L. Robson, chief mechanical officer, GN, will serve as vice chairman. New members of the General Committee are:

D. S. Neuhart, general superintendent motive power and machinery, UP.

W. F. Kascal, assistant vice-president-equipment, NYC.

F. B. Rykoskey, general superintendent motive power and equipment, B&O.

T. T. Blickle, general manager, mechanical department, Santa Fe.

R. E. Franklin, assistant vice-president, Southern.

discovered. Summarizing, Mr. Kiley said "people support what they help create."

Car Improvements Are Needed

In discussing special purpose and general purpose cars, G. Murray Campbell, vice-president and executive representative, B&O, pointed out that, while the former usually carry one-way loads, they turn fast and carry loads the railroads would not get without the special car features. But Mr. Campbell saved his principal remarks for the conventional all-around freight car and what it can do to prevent annual loss and damage claims approaching $100 million, of which nearly 80% is for unlocated or concealed loss and damage.

"I point my finger at the conventional freight car as a villain in this drama. There is much opportunity to provide better trucks, and springs, and snubbers, and draft gear, to minimize vibration in fast trains. Slack shocks in long trains are vigorous, and certainly can be reduced. It seems reasonable to assume that modern car design can permit switching impacts of 10 mph without lading damage or car strain". Mr. Campbell advocated a more descriptive code designation on freight cars—rather than just the present numbering—to identify the type of car readily, without recourse to the equipment register. In this proposed system, the great number of conventional box cars would need no prefix, but a 50-ft box car with double doors could stand a prefix "BHDD" before its number, to indicate a big (50-ft.), high, double-door box car. Similarly a solid end gondola car, with nailable steel flooring, could carry a prefix "SGN".

The B&O vice-president also posed an interesting fundamental question on what the railroads' primary aim should be. Should the emphasis be on providing the type of service the patrons want? Or should management set its sights on economies and expect the public to patronize the kind of service the railroads give?

Some Laws Outmoded by Progress

D. S. Neuhart, outgoing chairman of the mechanical division and general superintendent motive power and machinery of the Union Pacific, tackled the subject of government safety regulation. Emphasizing that the railroads fully support the intent of government safety regulations—but that this did not mean that they felt safety is furthered by laws, rules and regulations clearly outmoded by technical advancement—Neuhart said:

"Commencing in the 1890's, Congress and state governments have enacted various laws designed to promote the safety of employees and travelers upon railroads. We wholeheartedly subscribe to this intent. Safety in operation is a fundamental requirement of successful railroading, demanded by plain economic and competitive reasons, to say nothing of the humanitarian obligation. But when we continue to be burdened by laws, rules and regulations which have been clearly outmoded by advancements within the industry, and by new regulations and interpretations which have no merit in fact, the safety of employees and travelers is not promoted. . . . On the contrary, such policy results in waste of manhours and funds which could otherwise be devoted to improvements and new equipment with a realistic promotion of safety.

"It has been said . . . that the railroads are automatically opposed to any new regulation that would cost money, and records can be produced purporting to substantiate this contention. Certainly we have opposed and will continue to oppose enactment of any new regulation which in our experienced judgment is not necessary. And we will strive for the modification or elimination of regulations which have outlived their usefulness. Yet, the primary function of the mechanical division is to promote better equipment and maintenance, which are synonymous with safety.

"Hard-working committees comprised of qualified and experienced railroaders with an abundance of know-how are continually striving to develop better inspection and maintenance practices and better equipment. Practically every one of the committees' recommendations call for an expenditure of money, and some of them in very substantial amounts. But they were originated and are adopted without urging because it is known that the money will be wisely spent.

"All we expect and all we ask is relief from the wanton waste of unnecessary and archaic regulations, which sap our efficiency and growth, while our competitors are enjoying the fruits of government spending under a guise of development of national defense. When that is done, there will be no necessity for Senate sub-committees to investigate freight car shortages, nor for any other public concern about the plight of our railroads."

Activities of most of the committees of the Mechanical Division are reported on this and following pages. Discussions which followed presentations of the committee reports are usually included.

Water and Oil in Locomotive Air Brake Systems

Numerous experiments have been conducted in an attempt to effect an improvement, and the following is a progress report.

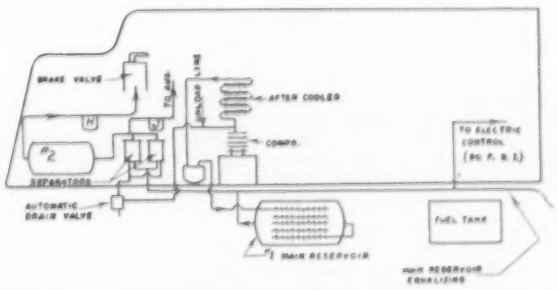
The carry-over of oil into the brake system from compressors is a problem that has been given constant consideration by the railroads with each trying various methods to eliminate this condition.

The following are some of the actions that have been taken: New type piston rings; Increased radiation; Use of special oil in compressor crank cases; Reduce main reservoir pressure from 130-140 to 115-125; Increase diameter of compressor discharge line; Applied automatic drain valve; and Applied mechanical type air separators.

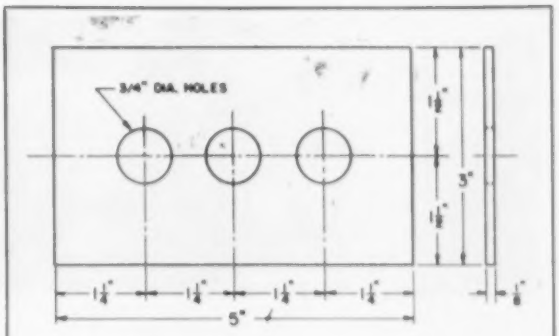
The application of automatic drain valves and air separators have resulted in an improvement; however, it has been found that the location of the separators in the main reservoir circuit is important, and it has been suggested that each application for location of the separators should be tested for at least one year.

One road has just completed a year's test of the mechanical separator working together with automatic drain valves and have relocated the separators three times in order to secure a maximum efficiency from the separators.

The accompanying drawing illustrates the third and final application of mechanical separators to a lead unit. This application appears to be desirable.



Separators and other components in the compressed air system of a diesel A-unit.



A liner for the journal box ceiling is intended to improve the hot box situation by providing proper relationship of the wedge to the roof of the box. A letter ballot item proposed by Car Construction Committee would call for welding the liner in the roof of any box gaged with the journal box crown wear gage and found worn beyond the condemning limit. The gage is shown in Fig. 1 of Interchange Rule 24, but up to now no repair has been required. The 3 x 5 x ⅛-in. plate is to be electric-plug-welded in the roof of the box using ⅛-in. mild steel electrodes. After welding, rough edges must be ground off flush with the liner. While ⅛-in. plate is shown, plates of 3/16-in. or more would be permissible. Inspection would be required of cars in repair shops, and on repair tracks whenever truck side frames or separable boxes are removed.

Domeless Tank Car

The tank car report contains recommendations and specifications of a highly technical and specialized nature. During the discussion a new design of tank car was described on which the dome is eliminated and pitting stresses are reduced.

Attention was called to the revised tank car rules. The changes are more than just clerical. Among them are a complete welding code; a repair code for riveted and welded steel and aluminum tanks; a table for retesting tanks; approval of shops for welding and welding repairs; and provision for re-inspection of shops every 5 years.

Hydraulic Transmissions for Diesel Locomotives

The present available designs appear to be limited in their horsepower capacity carried through one hydraulic unit. Electro-Motive has a locomotive using a hydraulic drive in service in Canada.

Representatives of Alco Products, Inc., presented a report at the last meeting with respect to this subject which is reproduced here.

Diesel Hydraulic Transmissions

American Activity

Many small locomotives have been built from 100 to 300 hp and twelve (12) to forty (40) tons in weight, rigid wheelbase design, and utilizing the speed range of a torque converter; a few were equipped with two (2) speed mechanical transmissions.

In 1951, Electro-Motive built a 360/400 hp locomotive with two (2) 180/200 hp GM 6-71 engines, each driving a torque converter. It was claimed that the locomotive was as efficient as a diesel-electric within its limited speed range. An increase in speed, it was felt, would require a transmission with a variety of gear

Diesel hydraulic rated at 2000-hp has MaK engines and Voith transmissions. Unit operates on German railways; has top speed of 85 mph.

ratios introducing problems which did not exist in diesel-electric locomotives. The engines were mounted under the frame and drove the inside axles of the 'maximum traction' type truck similar to that of the two (2) motor street car.

Electro-Motive introduced the four axle drive hydraulic locomotive powered by an 800 hp model 567 engine, 40 mph maximum speed and 57,000 pounds continuous tractive effort at 2.6 mph in 1953. The transmission was an Allison torque converter with automatic three-speed change gears with a drive to the near axle in each truck and then to the far axles.

A step-up gear drive to the torque converter permitted the use of the slower speed engine and the handling of torque valves through power actuated friction clutches. A drop-box provided forward and reverse drives and adjusted the torque to valves more readily handled by the drive shafts with final values adjusted in the final gearboxes.

Baldwin-Lima-Hamilton in 1953 received an order from the Transportation Corps for a 500 hp road switching locomotive with a Maybach Mekydro transmission. This transmission consisted of a torque converter followed by a four speed power shifted mechanical transmission using jaw clutches.

Baldwin-Lima-Hamilton is building two (2) special truck locomotives for close coupling to the end coach of each of two train X's for the New Haven. A Maybach 1000 bhp engine with the Maybach Mekydro transmission for which BLH holds the American license is to be used. A shorter train for the New York Central is to have one Maybach eight cylinder 600 hp engine, weighing 150,000 lb. and 45 feet long.

The Budd RDC is, also, a common hydraulic transmission application to the GM 6-71 engine.

German Development

This hydraulic locomotive development, by far the most outstanding in the world today, emanated from the German Railway Office at Muenchen and the voluminous and detailed material will be only touched upon here.

The railway office about 1939 started to review engine, transmission, locomotive and motor car design for the purpose of arriving at a minimum number of proven engine and transmission designs and locomotive and rail car types. The electrical equipment manufacturers were located in East Germany and for this and reasons which the Germans claimed to be greater efficiency, horsepower utilization, higher continuous ratings at lower speeds, higher horsepower/weight ratios and cost decided on the hydrodynamic transmission.

After a study the engines shown in the table were chosen.

Engines Used with Hydraulic Transmissions

MAKE AND TYPE	HP	RPM	BORE AND STROKE mm	WEIGHT-LB	WT/HP
Daimler-Benz, MB 820 Ab	800	1400	172/205	6204	1.75
Daimler-Benz, MB 820 Bb	1000	1500	175/210	5525	5.52
M.A.N.Lv 12.17.5/22 B	800	1400	175/210	9240	7.75
M.A.N.LV 12-18/21 BmA	1000	1500	180/210	7950	7.95
Maybach MD 650:					
Later type	1000	1500	185/200	9834	9.83
Earlier type	1000	1500	185/200	9000	9.00

The following transmissions were chosen: Maybach—Mekydro—K104; Voith—T36.

The Maybach Mekydro consists of a hydraulic converter with either a three (3) or four (4) gear combination and a continuously filled converter. The gears are continuously in contact and are connected through claw clutches with overriding jaws.

The Voith drive has a starting converter and two (2) March converters which work with different intermediate gearings.

These transmissions have been applied in the following combinations: Daimler—Voith; Daimler—Mekydro; MAN—Voith; MAN—Mekydro; and Maybach—Mekydro.

The following locomotive builders participated: Krauss—Maffei; M. A. K.; Henschel; Krupp; Jung; and Maschinenfabrik Eslingen.

The following locomotive types were developed: V—2000—2000 hp with 2—1000 hp engines for heavy road service; V—80—800 or 1000 hp for passenger, freight, hump yard or transfer service; and a V—65—650 hp, three (3) axle, rigid coupled for road or switching service.

The truck frame is built like an open box, open on the bottom and the top, with four (4) projecting arms, like an H, that rest on flat springs on the axle bearings. The axles are not carried in journal guides, but rather in axle steerings with self-aligning axle roller bearings. The axle steerings are guided by a crossmounted pivot in rubber bushings.

The changeover and distributor gears are installed at the truck pivot location, the centerplate or truck centering function being accomplished by a linkage arrangement which guides the truck around a virtual centerplate.

German Hydraulic with 1250 rpm Engine

Henschel and Sohn departed from the Muenchen standard design by bringing out a 750 hp locomotive with a 12 cylinder V engine and a 875 hp locomotive with a 14-cyl. V engine, both by Henschel Maschinenbau G. M. B. H. at Hamburg for maximum speed of 60 mph and with a Voith L372A transmission.

France

The French lean towards the electric transmission and while they have some hydraulic locomotives, they are of an older vintage than the Germans.

Recently Ateliers et Forges de la Loire built eight (8) locomo-

LETTER BALLOT GOES TO AAR MEMBERS

Fifty-nine items recommended for letter ballot action by nine of the committees of the Mechanical Division were submitted to AAR members for vote on July 18, 1956. This ballot closes on August 20, 1956.

Majority of the letter ballot items would affect standard pactices as related to freight and passenger cars. The Committee on Roller Bearings submitted a standard specification for the freight-car roller bearing. The Committee on Wheels prepared new specifications for one-wear cast-steel wheels, for one-wear wrought-steel wheels to accommodate the alternate raised wheel axle, and asked for elimination of a specification for a cast spun steel wheel which is now obsolete.

Many of the other committee recommendations are in the reports on these pages.

tives for French West Africa with the 850 rpm Sulzer 6LDA25 six (6) cylinder turbo-charged engine with a one hour rating of 850 hp.

The Voith L36 RD transmission with three (3) converters was used and the step-up gears driven from the engine through a Secheron blade type of flexible coupling.

England

The British have confined themselves to electric transmissions on locomotives of our sizes and used hydraulic transmissions on small shunters and motor cars.

However, recently North British Locomotive Company built twenty (20) locomotives for India with a Paxman 12 RPHX 12 cylinder 7 x 7¾ engine at 1250 rpm and the Voith-North British type L36R hydraulic transmission.

The Hydraulic Coupling & Engineering Co., Ltd., had the British Empire rights to make the Voith turbo-converter transmission. After the war, the plant at Isleworth was fully occupied making Vulcan-Sinclair couplings so the rights for the Voith converter were transferred to the North British Locomotive Co.

The above mentioned locomotives are closer to our design than the Germans, in that the trucks have a centerplate on a rigid bolster, and suspension is by a single large laminated spring on each side suspended by links from single equalizers resting on the journal boxes.

General locomotive arrangement is almost a duplicate of our road switchers with the Voith L36 in place of the generator. The transmission reaches down through the frame and the drive to the primary (near) axle mounted gearboxes is through Hardy Spicer cardan shafts and Universal joints.

The primary gearboxes on the near axles drive secondary gearboxes on the far axles through secondary cardan shafts and Universals which pass under the rather shallow bolster. Each gear box has a single helical and spiral level reduction gear to the axles. The reaction torque is taken through torque arms and rubber bushes to the center transom.

Locomotive Weight and Weight Per Horsepower

The advocates of the hydraulic locomotive, mostly the Germans, make great claims for its superiority on a weight and weight per horsepower basis over the British and, even more so, the American diesel-electrics.

However, part of the Germans weight advantages lies in the use of very low weight/horsepower 1500 rpm engines. Also, their car bodies and trucks are lighter than ours.

Generally speaking, the Germans, French, and English have higher horsepower/ton train weight ratios than we do and as a result lean in the direction of lighter locomotives. Our crew expenses represent a higher portion of total locomotive and train operation expense than the Europeans, and we, therefore, lean towards longer trains for the purpose of decreasing the manpower cost per ton hauled or per passenger.

Our lightest diesel-electrics have been the Army locomotives and other preliminary designs for two (2) other railroads. Even including these, we have never gone below 100 lb/hp locomotive weight while the Europeans are now in the 70's and 80's.

We, also, have the high buffing requirements to meet which are non-existent in Europe.

The lighter weights of the European trains, the lighter locomotive axle loadings and their higher horsepower per unit train weight ratios all tend to keep their locomotive transmission torque requirements lower than ours which requirements have, so far, been met so admirably by the electric transmission in America.

Adhesion

There have been many claims for the diesel-electric superiority over the steam engine adhesionwise. The steam locomotive main and connecting rods apply their forces to the wheels with a resulting undulating torque at the wheels while the traction motor torque is constant because of the great number of armature coils exposed to the magnetic force applied to them by the four and six pole motor fields.

However, the wheels on the steam locomotives are mechanically coupled while the axles on the diesel-electric are not only not coupled, but subject to greater weight transfer because of the short truck wheel base compared to the centerplate height from the axle centerline or rail surface about which centerplate of the truck tries to rotate when pulling the locomotive train.

The hydraulic transmission has the adhesion advantage of having all of the driving wheels mechanically coupled. Adhesion has been one of the great problems on the diesel-electric locomotives.

Part of this problem is the result of bad engineering in the form of poor weight distribution and bad application when four motor six axle locomotives have been applied where they should have been four or six motor locomotives to begin with. Part of the problem is the result of the fact that the electrically driven wheels are mechanically isolated and when a wheel starts to slip the coefficient of friction almost collapses.

Efficiency and Utilization of Horsepower

No attempt will be made to compare efficiencies of generators, motors separately or together with the hydraulic transmission because such a comparison could become hopelessly involved. A more significant comparison would be that of horsepower utilization capacity.

It is not generally recognized, but the average diesel-electric switcher of today has what could be called a single stage utilization curve which peaks at about 25 mph and begins to decrease appreciably at 30-35 mph. This can be seen by watching the fuel racks where the racks begin to back off at 32-35 mph. The only improvement possible is the addition of a 4 motor in parallel grouping on the Alco switcher which expands full utilization out to 60 mph.

Our 9 x 10½ road switchers and road locomotives have an admirable utilization characteristic, and they all hold full load to about one hundred per cent of full speed. However, because of a slight decrease in motor and generator efficiency the horsepower at the rail decreases by a small amount.

Generally speaking, the hydraulic transmissions will be lower in efficiency than the electric from a considerable amount to a small amount for the very best.

The Voith T-36 is a three stage converter transmission with three peaks while the Maybach Mekydro K104 is a four gear and converter with four peaks and, therefore, has a slightly flatter and very slightly higher efficiency characteristic which is the result of the addition of the multi-stage gearbox.

It must be remembered that the European locomotives and trains are lighter and, therefore, the tractive force and hence, transmission and final drive requirements are considerably less than ours. We are reaching for 65,000 to 70,000 lb. load per axle backed up by a motor of 600 hp.

However, with the light axle loading requirements of the Canadian locomotive, we are well under the realm of development and experience of the hydraulic transmission.

Reliability and Maintenance

This aspect of the comparison is the one we know the least about. To fairly compare the relative costs, we should have comparable figures from railways operating both types in similar service, but such operation in the world is known at this time.

There are two comparisons that have possibilities of almost duplicate locomotives with the two different transmissions if the data were available.

In 1954 sixteen (16) diesel-electric B-B locomotives were built for the Dakar-Niger Railway in Africa by Alsthom (France) with 610 hp Sulzer engines. In 1955 eight (8) more were built for this railroad with the same engine and Voith transmission by Ateliers et Forges de la Loire.

The only other direct comparison possible is that between the EMD 800 hp diesel-electric and the 800 hp EMD hydraulic test unit.

Isolated maintenance cost figures have been quoted, but they are of little value because the effect of factors other than transmission predominate such as the type of engine, mechanical design, maintenance standards, service, local standards of labor and living, etc.

One of the claims made for the hydraulic transmission is that it eliminates electrical maintenance, which maintenance we know to be about twenty-five per cent of the total.

There is almost as much electrical equipment on the larger hydraulic locomotives, particularly those with multiple-unit control as there is on the diesel electrics and most of it of less robust construction.

Failures of electrical transmission are rarely in the transmission itself and usually in the control, wiring, and auxiliaries. Experi-

ence with pure electric transmission equipment in street railway, trolley bus and electric railway service has proven that its availability and reliability is such that other forms of transmission or transportation can show no real improvement.

Another attribute not to be lost sight of is that the electric transmission enables the engine to be reduced to the lowest possible speed at which the horsepower can be developed. Our own mutual observation of city buses and automobiles illustrates the high engine speed the hydraulic transmission requires for the purpose of loading the engine and producing acceleration, although they are getting better. The rigidly coupled wheels can develop parasitic load due to unequal wheel wear.

The electric transmission costs about $25 per horsepower and the locomotive for about $90 to $105 per horsepower. In a preliminary contact with a transmission firm, they claim that they can give us a converter for $6 per horsepower which is just the beginning.

Design Problems

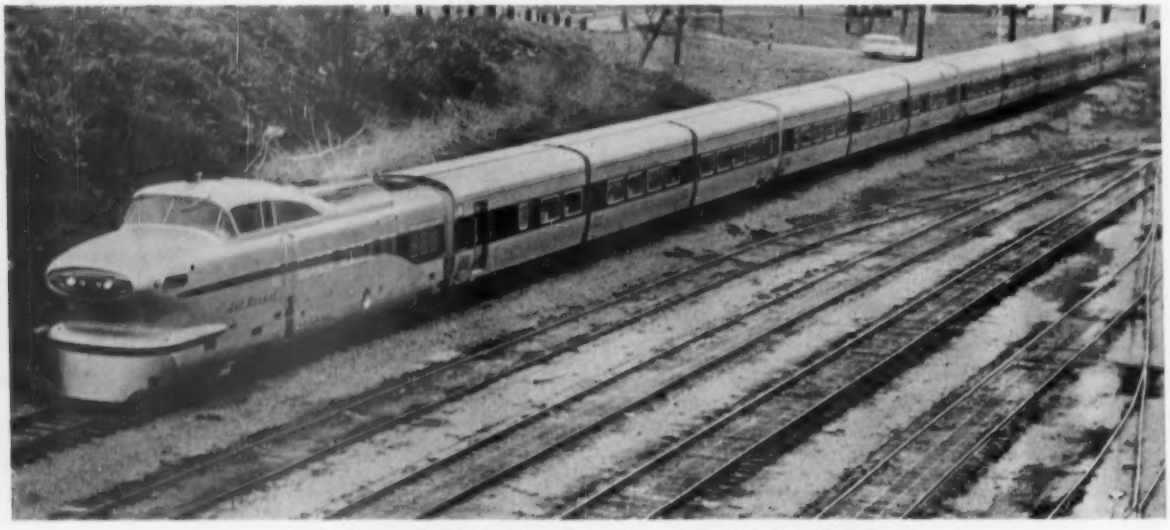
What are the design problems? They are listed in the following paragraphs:

- The type of transmission and its mounting would have to be developed including a possible step-up gear and coupling. Crankshaft vibration calculations would have to be made. A flywheel may be necessary.
- The underframe must be redesigned somewhat to receive the transmission on top and the drive from underneath. This may require spreading out the centersills.
- The truck center transom must be redesigned to clear the cardan shaft connecting the two axles and provide for the reaction connection for each gearbox. If it is decided to go to the more complicated arrangement of locating the truck driving gearboxes at the centerplate location, an entirely new truck design concept faces us including a new method of suspension and truck center retailing linkage like the German development.
- The cardan and spline shafts will be no small assignment. The cardan shaft and universal joint angularity should be studied carefully for the proper angular offset and cardan effect.
- The gearboxes on each axle will have to be purchased or designed and will include single helical and spiral level gears.
- The cooling system capacity must be increased to include the transmission loss oil heat load.
- The electrical system will be reduced to cover the auxiliaries only, m-u if needed, and cranking, if electrical cranking is needed.

Does Penetration or Crack Come First?

The axle program now being formulated will include further research on fatigue cracks occurring between wheel seats of axles in high speed service (both laboratory and road tests), cold breaks in the journal area, and investigation of diesel locomotive axle failures. It will also cover copper penetration—partially to see if the penetration causes the crack, or the crack causes penetration.

Non-ferrous metal migration is being investigated by dipping 1-in. round SAE 1045 steel specimens in five different molten metals, one of which is the composition referred to as phosphor bronze like that used in driving box bearings of steam locomotives. Because little difficulty was experienced with copper penetration of such journals this material is being examined to see if it causes less copper penetration than standard journal bearing metal.



THE TALGO TRAIN DESIGN MEETS AAR REQUIREMENTS

Talgo satisfactorily meets the strength requirements of AAR specifications for passenger cars according to the Committee on Passenger Cars. They have also acted to recommend mandatory use of 2½-in steam train line connectors to facilitate the heating of long passenger trains and to avoid damage which results when two different sizes of connectors are brought together.

Discussion of the new lightweight trains found F. H. Einwaechter, B&O chief engineer of motive power and equipment, stating that there was little data available on lightweights other than the Talgo. He said that the failure to agree on a single design by a lightweight train committee formed by six railroads was probably "healthy" since it promoted further individual development work.

J. D. Loftis of the Rock Island reported that the original Talgo drum brakes have been replaced with more conventional tread type, and that the axle steering arrangement has been removed from the ends of the three-unit cars in the "Jet Rocket." They have found that the tie through the tightlock couplers is sufficient for guiding behind the heavy locomotive. It is anticipated that steering of the intermediate axles of the coaches will also be eliminated.

Acceptance of a-c power from a single source on all the lightweights has been a significant step according to Mr. Loftis. It makes possible small package units cutting weight and simplifying maintenance. Lighter materials do not sacrifice safety, and he feels that there are still many possibilities in materials not yet used. Not all the possibilities are even developed in more conventional equipment. The Rock Island is currently producing head end cars which cost a great deal less than such equipment previously purchased. Tests at the present should develop the train of the future. Tomorrow's trains must be studied to determine whether the equipment should be repaired or replaced when no longer suitable for service.

Investigation of two "cold breaks" in journals did not show any indication of copper inclusion in the cracks leading to the breaks. Evidence showed that the cracks started at the journal surface and that a thermal change in the metallurgy of the steel may have initiated the cracks.

One road found one defective axle in each 2416 inspected with ultra-sonic equipmemnt. Ultra-sonic inspection was also the subject of a substantial part of the discussion. The SP reported that its ultra-sonic unit tested 1,000 cars on the Sacramento repair track. Four bad axles were detected, and subsequent examination confirmed all these defects.

The C&O reported on its extensive experience with ultra-sonic inspection. Twenty mobile units are now in service at all main repair tracks. After inspection of 70,000 cars the ratio of defective axles found has been reduced from 1 cracked axle in 400 cars to 1 in 2,580 cars. Inspection cost per journal averages only 8½ cents, assuming an average of 40 cars inspected per day with each unit and a 10-year depreciation on the equipment. Defects detected by the Reflectoscope are checked by Magnaflux in the shop.

What to do with axles on which cracks are detected remains a question. The UP felt that the overheating is actually the only cause of penetration, and that subsequent location and removal is expensive and difficult. Therefore, all overheated axles should be scrapped. Others contended that automatic removal after overheating can't be justified.

The Pennsylvania advocated a compromise plan which calls for (1) taking a light skinning cut on all overheated axles, (2) cleaning and magnafluxing the surface and (3) scrapping the axle if a crack can be detected. Pennsy experience is that the labor cost to try to clean up journal cracks in a lathe cannot be justified because too many (up to 95%) axles get below the condemning limit before the crack is turned out.

The poor response to the AAR survey on "cold breaks" was attributed to the fact that these are rare. Cold breaks were also reported to have started with thermal cracks from overheating.

Hot Boxes Attacked on Wide Front

Two to six times more mileage per hot box has been experienced by the Pennsylvania when cars are equipped with various types of the new journal lubricating devices according to PRR engineer of tests M. A. Pinney. These PRR results are not based on test installations on only five or ten cars, but on results from at least 200 car sets of each type of lubricator. All test lubricators of any one type are applied to cars of the same class and in the same service. Performance of the same cars with loose packing over the same period is always used for comparison. These facts were brought out during discussion of the report of the Committee on Lubrication of Cars and Locomotives.

H. M. Wood, assistant chief of motive power of the Pennsylvania, amplified this by reporting that 91 AAR members owning 82 per cent of the total car fleet are involved in work with these devices. Some have only 10 to 15 car sets, but owners of 45 per cent of the cars already have 1 to 30 per cent of their car fleets equipped. The Pennsylvania has operated the devices since 1949, and the seven years of experience with this method of lubrication involves such installations as 500 cars which have accumulated over 30,000,000 miles of operation since being equipped. The Pennsy now operates 15,500 cars with lubricators or packing containers.

Mr. Pinney summarized his statement by saying that the lubricating devices do perform satisfactorily, they do reduce hot boxes, and there is indication that a three-year repack period will be satisfactory.

B&O superintendent of motive power F. B. Rykoskey states that over 10,000 lubricators on their cars showed better performance than loose waste packed cars, and helped to improve the B&O hot box record over the past three years. The Santa Fe has successfully renovated lubricators in a standard waste washing machine according to A. J. Shulte, AT&SF lubrication supervisor. The machine's agitators were replaced with baskets which held the devices. The renovation was performed after 90,000 miles, and the lubricators have been operating successfully since going back into service.

Journal Stops Show Results

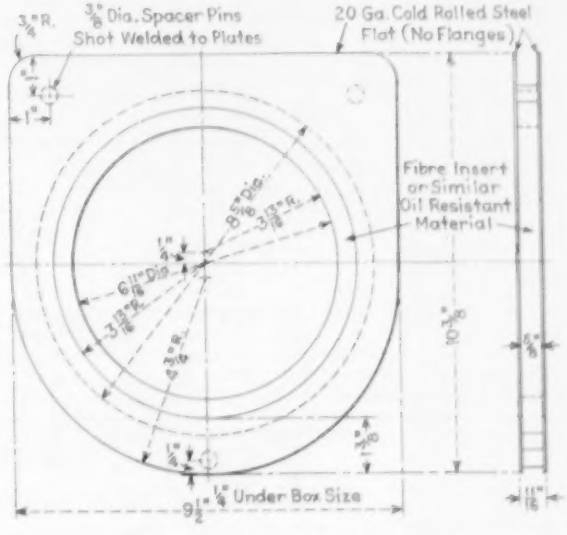
During the year, two additional lubricating devices were approved for limited application. They are the Southland lubricating pad and the Journapak journal lubricator. Another approach to the problem of hot box reduction has been the RS journal stop and packing retainer. The committee reported on a Frisco ballast car which had only its A-end truck equipped with stops. After an estimated 100,000 miles of service in 53 months, the original A-end bearings were in "good" ocndition with no more than 1/32-in. end wear. All the B-end truck bearings were condemnable. The committee commented on how the RS stop had prevented the spreading of the bearing lining. An inspection of five SLSF automobile cars with two years of high-mileage operation caused the committee to report that the edges, journals and dry seats were in "new" condition, and that the bearings were in "excellent" condition. Flange wear negligible, and it was stated that the RS stop had lengthened flange life. Summarizing RS performance, it was said that the device is a satisfactory waste retainer, and does prevent spread journal bearing linings.

IC Cuts Hot Boxes

The Illinois Central's dust guard cavity filler applied to 275 pulpwood cars allowed them to have a hot box performance record nine times better than 1,531 conventionally-equipped cars in the same service. The device serves both as a dust guard and as an axle stop to prevent excessive movement of journals in boxes. The filler does not occupy the entire dust guard well, and a portion of a regular dust guard should be used to fill the upper portion of this space. The committee has approved the application of this cavity filler to 2,500 newly-built Illinois Central cars in regular interchange service. Results to date are reported "very good".

Approval has been given for the application of up to 40,000 rear journal box seals developed by the Empire Journal Lubricator Company. The seal was developed in conjunction with the lubricating device produced by this manufacturer, but is offered now for use with other free-oiling lubricating devices or with standard journal box packing.

The AAR Mechanical Research Laboratory also is working on a new type of dust guard intended to reduce the loss of oil at the rear of the box. This important problem has previously received a great deal of attention, and some designs have been successful in passenger car journal boxes. In freight cars, however, the excessive lateral movement of the box along the journal, and the relative movement of the box with respect to the axle during car impact have never been overcome with a dust guard and seal which has been economically feasible. The AAR design is a two-part device with a circular ring of hard, oil-resistant material contained in a sheet steel casting. The ring is not intended to turn with the axle, but is free to "float" inside the casing. Tests have been completed at the AAR Laboratory, and


3" Dia. Spacer Pins Shot Welded to Plates
20 Ga. Cold Rolled Steel Flat (No Flanges)
Fibre Insert or Similar Oil Resistant Material
9½" Under Box Size

Two-part dust guard of AAR design is a ring of oil-resistant material in a sheet steel casing.

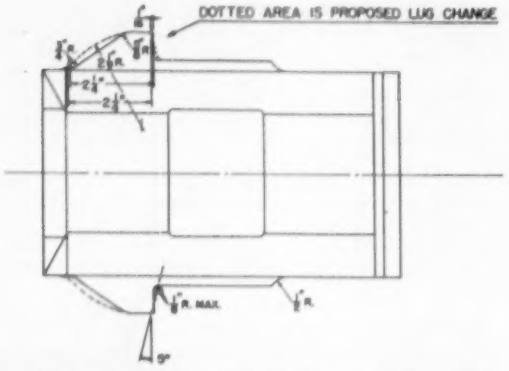
permission has been given by the committee for applications on 1,000 cars.

Bearing Lug Redesigned

Concerned about the problem of broken lugs on journal bearings, the AAR mechanical research laboratory has redesigned the lug to strengthen it. The committee published figures indicating that replacements because of lug failures probably cost over a half million dollars annually. Possible interference between a new journal box and the newly-designed lug was raised during discussion. The AAR Laboratory completed work which brought the committee to recommend as a letter ballot item the reduction of saturation time for new waste from 48 to 24 hours at a temperature of not more than 200-deg F.

Roads using special machines for machining and trimming the lining of second hand bearings can continue to do so according to the committee. They stated that there was "some advantage in obtaining a closer fit for reclaimable journal bearings restored to the same journals from which removed." However, the Mechanical division rules and regulations must be considered, and no charge is permissible when these machines are used for work on foreign line cars.

Work is continuing on determining if a single type of grease could be used on all types of roller bearing equipment. During discussion it was pointed out that there would be great advantage if only one type was necessary, and if only a single quantity could be specified.



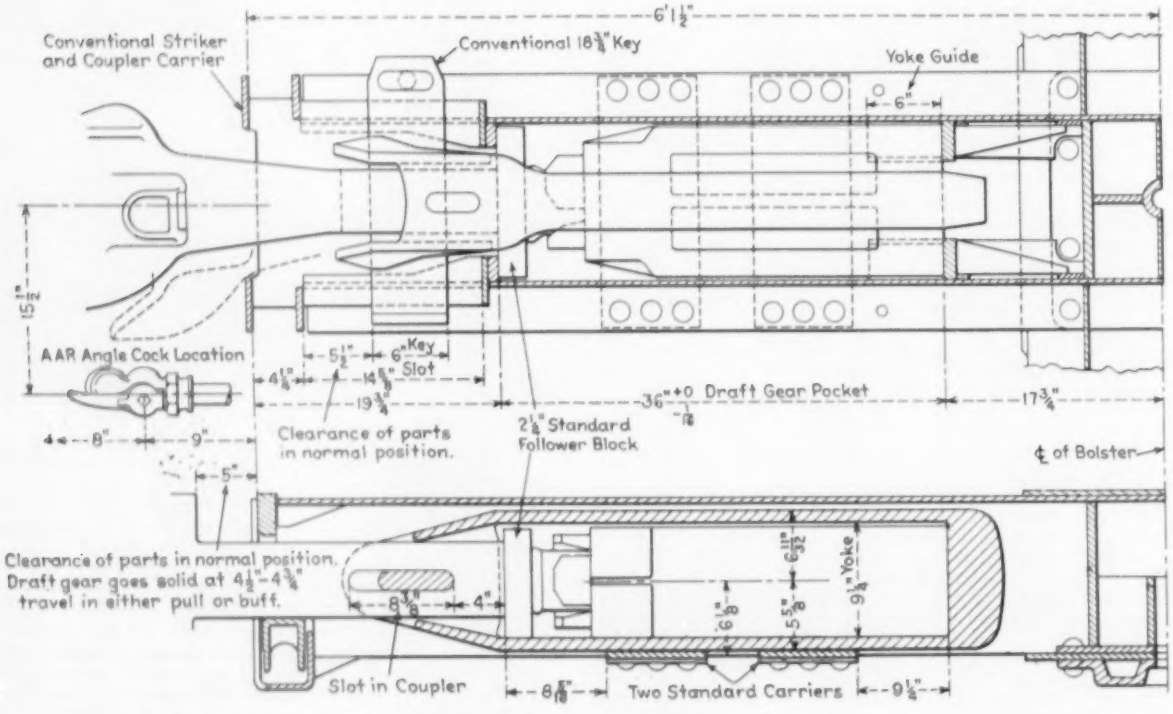
Bearing lug redesigned by AAR to have greater strength

Developments Reduce Coupling Shocks

Development of a draft gear of greater capacity and size has been considered for several years by the Committee on Couplers and Draft Gears. The Committee on Car Construction has prepared an underframe drawing for installation of this gear which has been proposed as an alternate standard along with the gear itself. In 1955 the Coupler and Draft Gear Committee approved the application of the experimental gear with 4½-in. travel and a capacity of 75,000 ft lb to 150 Sante Fe refrigerator cars. This gear contains a combination of rubber and friction elements. The Sante Fe reports that their impact tests have shown almost complete energy absorption. During testing, the sill stresses developed in a car with long travel gear were nearly the same both when the struck car was standing by itself and when it was the end car of a string with bunched slack. Already permission has been given for application of this long gear to 1,000 box cars. It is possible to replace the 36-in. gear and yoke with the standard 24⅝-in. gear in an emergency, and instructions have been prepared for applying the standard E coupler in place of the long-travel coupler.

The Southern Pacific has found that their hydraulic cushion underframe is one that gives outstanding results in both shock absorption and damping. A pilot model of the production design has been completed and is a single package requiring no external piping. AAR has been asked to approve the underframe design for use in interchange service, according to P. Garin, SP research engineer.

The Cardwell Westinghouse Mark-40 friction draft gear has been offered for approval. It is an attempt to provide high draft



The long-travel 36-in. draft gear approved for installation on 1,150 cars has caused the Car Construction Committee to prepare standard end arrangement.

gear capacity in the standard 24⅝-in. pocket. The gear has a travel in excess of the specified 2¾-in. The Committee has agreed to make the approval tests. Four standard pocket gears did receive approval for limited application during the past year, and approval was given for five short pocket gears.

A Frisco spokesman said that the 36-in. pocket was long overdue, and it should double capacity at nominal cost. The committee warned that increased use of high capacity gears will not eliminate damage to structure and lading at switching speeds of 8 to 10 mph. If their use encourages an increase in present coupling speeds, there will be little return from the increased investment. Present standard draft gears wil continue in service for a long time in any case, and particularly for cars with these gears, higher switcihng speed could bring abouteven greater damage than is now experienced.

Codes Will Permit Comparison of Economy Fuel Tests

The Mechanical Division's newest committee was formed after the 1955 meeting to "encourage and promote for American railroads scientific cooperative research in developing the best combinations of fuels and lubricating oils for diesel engines in railroad locomotives." The Committee on Lubricants and Fuel for Diesel Locomotives is to facilitate cooperation between railroads, and with the AAR research center and suppliers of engines, fuels and lubricants. Preliminary draft of a laboratory and field service test manual has been distributed to committee members. This is to establish uniform procedures allowing results obtained by tests on one railroad to be compared with those on another—test methods and reporting have previously lacked the uniformity to make this possible.

Cooperation with engine builders and oil suppliers in establishing the test code is being done through the Coordinating Research Council of the American Petroleum Institute and the Society of Automotive Engineers. This study has already been made the subject of a CRC project. Consideration has been given to installing a diesel lubricating fuel oil test engine or engines at the AAR research center.

During the year the committee developed the following specification for fuels supplied for mechanical refrigerator cars:

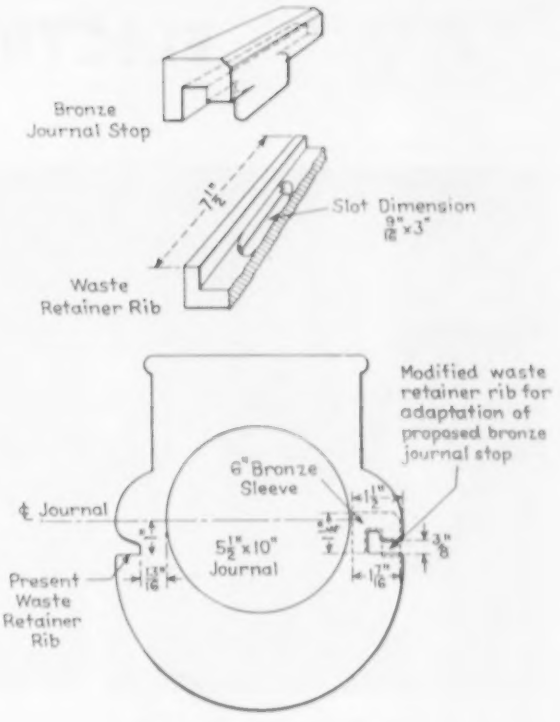
It should meet the requirements of ASTM D-975 Diesel Fuel Oil Specifications for 1-D fuel. Some grades of kerosene will comply with these specifications. In addition,

Flash point	125-deg F minimum or legal
Pour Point: October to March	Maximum minus 15-deg F or 10 deg below anticipated ambient temperature
March to October	Maximum 0-deg F
Cloud point	Not more than 10-deg F higher than pour point.
Cetane Number	45 Minimum

Retainer Ribs May Go Back Into Journal Boxes

Restoration of the waste retainer rib in journal boxes has been proposed by the Car Construction Committee. The integral rib was adopted as standard in 1943, and was changed to an alternate standard in 1950 after it was found that the spring packing retainers available at that time could not be used in boxes with integral ribs. Since then, spring packing retainers have been developed which do fit in boxes with the integral ribs. With recent letter ballot approval of an eventual ban on loose journal box packing, the committee reported, "As is generally known, some of the designs of journal lubricating devices function much better with some kind of a retaining rib or stop in the journal box to prevent rotary movement and contact with the journal bearing."

When it appeared advisable for the committee to recommend restoration of the retaining ribs, the mechanical research department asked that consideration be given to accommodating bronze journal stops which the research group would design. The details of the proposed stop are only tentative, and the letter ballot will cover only restoration of a modified retaining rib which will serve the same purpose as the former design for those roads which do not want to use the bronze axle stop. During discussion it was emphasized that the stop is not yet perfected, and has not been tried. A spokesman for side frame manufacturers said that the proposed rib was being studied to determine its effect on production methods and cost. He said that the previous rib was simple and not costly, but emphasized that the modified design now proposed is complicated and might be reflected in higher prices for side frames.



AAR-proposed waste retainer rib could accommodate journal stop.

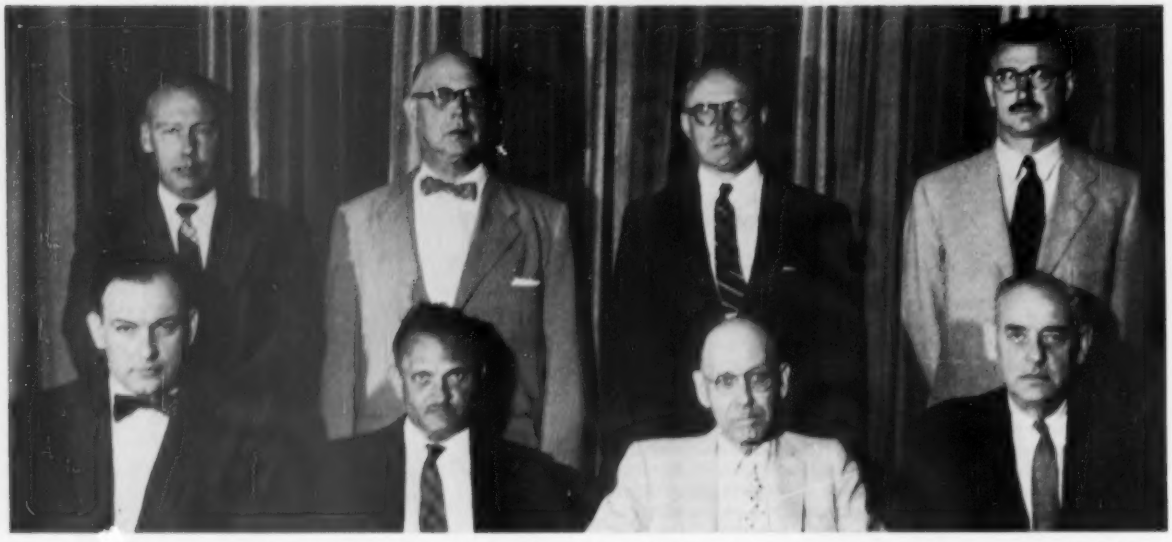
Although the Arbitration Committee has already proposed a letter ballot raising the minimum clearance from the rail to the lowest part of the car body or car truck from 2½ to 2¾ in., this subject is still being studied from the standpoint of horizontal and vertical track curvature. The Committee on Car Construction is working with the Engineering Division of the AAR in this investigation. H. Nelson of Fruit Growers Express said that they have had underslung heaters torn off 50-ft refrigerator cars on car float aprons and in third rail territory. He also said that difficulties in retarder yards have been investigated, and wear in the retarders and low track joints have on occasion caused retarders to be as much as 3⅝ in. above the rails.

The Committee has acted to change the maximum stake pocket spacing on flat cars from 3 ft 6 in. to 4 ft. This will be the subject of letter ballot action. A revision of the lading strap anchor arrangement for flat cars has already been approved. Another letter ballot item will call for the stenciling of a circled W on the sides of gondolas equipped with wood flooring. This was done at the request of the General Committee of the Operating-Transportation Division to save time in switching, and to protect cars from ladings which might damage wood flooring. During discussion it developed that cars with Armco or composite flooring would probably be marked in the same way.

Standard coupler carriers and striking castings for cars having the Type F interlocking coupler have been proposed for letter ballot action. Approval of the coupler itself was voted in 1953. The Committee on Couplers and Draft Gears this year has proposed changes in regulations covering welding of wear plates on couplers. They apply to locomotives and passenger cars, and involved are the Type H, high-tensile Type F, and high-tensile Type E. Member roads during the year have reported difficulty with the breaking of the hook of the articulated rotary locklift assembly, with partings of trains having cars with spring type coupler carrier irons, with partings of trains caused by poor

(Continued on page 80)

ELECTRICAL SECTION . . . .



Plans for the coming year were laid by the members of the Committee of Direction, Electrical Section, AAR, in aatendance at the 1956 Annual Meeting. From left to right, they are (top row): R. F. Dougherty, UP, J. O. Fraker, TP, E. J. Feasey, CN, J. J. Schmidt, D&RGW;—(bottom row): S. W. Marras, secretary, Electrical Section, R. I. Fort, IC, Chairman K. H. Gordon, PRR, S. B. Pennell, NYC. Other members of the Committee are H. P. Wright, B&O and C. R. Bland, C&O.

Electrical Progress

What the Electrical Section is doing is the No. 1 criterion of what the railroads are doing electrically

The eighteen technical reports received by the Electrical Section of the Association of American Railroads during the week of June 25, 1956 at the Hotel Sherman in Chicago, constitute a package of information which tells what the railroads are doing electrically and also tells why. Parts of the reports are in the process of becoming Manual material while others cover recent developments of current interest.

In his opening address, Chairman K. H. Gordon, assistant electrical engineer, Pennsylvania, said, "It requires little imagination to recognize the tremendous amount of work by the committees that this volume presents."

The Section has long been a live one and to further increase the activity of all members, Vice Chairman S. B. Pennell, assistant engineer, New York Central, in his report of the Committee of Direction, announced henceforth officers will assume their duties at the close of each annual meeting and that members of the Committee of Direction will serve for three years only.

Officers elected to serve during the coming year are:

Incoming Chairman S. B. Pennell presents the report of the Committee of Direction.

Chairman: S. B. Pennell, assistant engineer, New York Central.

Vice Chairman: C. R. Bland, assistant electrical engineer—rolling stock, Chesapeake & Ohio.

Members of Committee of Direction, to serve three years: D. M. Burckett, electrical engineer, Boston & Maine, and P. B. Burley, superintendent communications and electrical engineer, Illinois Central.

Secretary S. W. Marras is resigning, effective August 1, to become assistant secretary-general manager, United

W. C. Brown presents gavel to Chairman K. H. Gordon in behalf of the Railway Electric Supply Manufacturers Association.

Engineering Trustees. It was announced that he will be succeeded by Carl Elber, Pennsylvania.

D. S. Neuhart, Chairman, Mechanical Division, A. A. R., praises work of Electrical Section and asks for simplification of electrical controls.

Chairman Neuhart Addresses Section

In an address to the Section by D. S. Neuhart, chairman, Mechanical Division, A.A.R., he praised the work of the Section highly and called for a simplification of electrical control equipment.

C. W. Martin has taken over the onerous task of conducting the affairs of the Committee on Wiring Diagrams.

Wiring Diagrams

One of the most heroic assignments ever undertaken by an Electrical Section Committee is that of establishing standard specifications for wiring diagrams. The work requires infinite patience and broad knowledge of the subject to obtain general agreement, but much has been and is being done by the Committee on Wiring Diagrams to make diagrams more understandable and to greatly simplify the requirements of railroad drafting rooms. The net gains will be more usable prints for the shop men, and reduced costs of drawings.

This year's report is concerned primarily with specifications for schematic diagrams and wire markings for schematic and connection diagrams.

It was presented by C. W. Martin (B&O). A major part of the discussion was concerned with the relative values of one large wiring print as compared with the 8½-in. by 11-in. form of diagrams. Men in the shops like the large prints because they are used to them, and they can put a pencil on a circuit, and follow it from one end to another. On the other hand, the large prints are difficult to handle and it is felt that the men in the shops will learn to like the smaller ones—that they are designed to help the wiremen rather than the draftsmen.

One railroad reported that it uses one single sheet for main power and auxiliary circuits showing take-offs to other appropriate pages. This arrangement is reported to be used without difficulty.

Presenting the report of the Committee on Automotive and Electric Rolling Stock was the responsibility of J. F. Partridge.

Automotive and Electric Rolling Stock

The first part of the report is concerned with the revision of Manual material on intervals for overhauling motors and generators, auxiliary power systems with special reference to batteries and standby lighting and miscellaneous motors and generators.

Concerning the testing of engines, the report offers the following formulae:

Horsepower at the output of the main generator can be determined as follows:

$$\text{Main generator output Horsepower} = \frac{\text{Gen. volts} \times \text{Gen. amperes}}{746}$$

or where output is read in watts:

$$\text{Main generator output horsepower} = \frac{\text{Watts}}{746}$$

If the generator efficiency curve is available, horsepower input into main generator can be found thus:

Horsepower for traction at engine—

$$\text{Generator coupling} = \frac{\text{Main generator hp}}{\text{Generator efficiency}}$$

As an alternate to the above formula, where approximate results will suffice, the following may be used:

Horsepower for traction at engine-generator coupling =

$$\frac{\text{Gen. volts} \times \text{Gen. amperes}}{700}$$

On the subject of train resistance, the report lists the Davis formulae which have long served as accepted standards. It then shows modified and more exact Davis formulae for train resistance of locomotives and cars respectively. These are as follows:

Locomotive ..... $R_L = 1.3 + \frac{29}{w} + 0.03\,V + \frac{0.002\,A\,V^2}{wn}$

Cars ..... $R_C = 1.3 + \frac{29}{w} = 0.03\,V + \frac{0.00034AV^2}{wn^1}$

R_L and R_C—Resistance of locomotive and cars in pounds per ton of weight.

w—Weight in tons per axle, locomotive or cars.

n—Total number of axles on locomotive.

A—Height of unit divided by 14.9 and multiplied by 120.

n^1—Number of axles per length of train equivalent to 80-ft passenger cars.

0.002—Arbitrary reduction of Davis constant 0.0024.

V—Speed in miles per hour.

Additional modifications are proposed.

The report also proposes recommended functions for receptacle points in locomotive jumpers as follows:

Receptacle point	Function	Receptacle point	Function
1	Spare	15	Engine speed
2	Alarm signal	16	Fuel pump and engine run
3	Engine speed	17	Brake relay
4	Negative	18	Parallel
5	Hump control	19	Shunting
6	Generator field	20	Brake warning
7	Engine speed	21	Dynamic braking
8	Forward	22	Compressor control
9	Reverse	23	Sanding
10	Wheel slip	24	Brake control
11	Spare	25	Headlight control
12	Engine speed	26	Separator blow-down
13	Positive control	27	Boiler shut-down
14	Spare		

All 27 receptacle contacts should be wired to the appropriate electrical cabinet whether used or not.

The report was presented by J. F. Partridge (NYC). During the discussion, it was reported that ½-in. openings are insufficient for battery box drains—that they become clogged. The report recommends a 1½-kva, 60-cycle, single-phase, air-cooled transformer for standby locomotive lighting which has a 115/230-volt primary and a 75-volt secondary. A question concerning the necessity of a tapped primary was raised, and it was explained that it was sometimes convenient to be able to use the two voltages and that since it was a piece of equipment which was in commercial production, it could be obtained at a good price.

With reference to train resistance, it was pointed out that if some of the lightweight trains are to make good schedule speeds, they will need more power than has been built into them.

With reference to jumper circuits, it was stated that they should be selected so as to avoid having circuits which could cause serious damage by contact, placed in positions where they would not be adjacent to each other.

In response to a request for a hinged plug for locomotive battery filler openings, the matter was referred to the Committee of Direction.

L. B. Curtis, Chairman Electrification Committee told of rectifier locomotives for the Virginian and of electrification studies being made by the Pennsylvania.

Electrification

Clearances in electrified territory, size of bonds and specifications for Cadweld bonds constitute material being prepared for inclusion in the Manual.

The French high-speed tests in which speeds up to 206 mph were reached are detailed in the report. To attain these speeds with a train consisting of a locomotive and three cars, it was necessary to draw as much as 9,400 kw from the contact wire. The two trains tested, including the locomotives, weighed 183.5 tons and 210.5 tons respectively, and maximum power requirements were 8,200 kw and 9,400 kw.

Recent developments in electrification in the United States are listed as follows:

1. The purchase of 12 electric locomotive units of the Ignitron type by the Virginian. These locomotives will have a continuous rating of 3,300 hp and the wheel arrangement will be of the C-C type.

2. The completion of the installation of the 10 Ignitron locomotives for the New York, New Haven & Hartford. These locomotives have a continuous horsepower rating of 4,000, weigh 175 tons and have the C-C wheel arrangement.

3. The completion of the installation of 100 new Ignitron m-u cars by the New York, New Haven & Hartford. These cars have a 400-hp rating.

H. F. Brown (Gibbs & Hill) author of European section of special report describes advantages of electrification at commercial frequencies.

L. W. Birch presenting special report on electrification.

4. A study made by the Pennsylvania and others that showed the need of a certain number of new electric locomotives along the eastern seaboard and also proved the replacing of electric locomotives with diesel locomotives to be economically undesirable.

5. Making an electrification study of the Middle Division of the Pennsylvania—Harrisburg to Altoona.

6. A continuation of the modernization of motive power and substation equipment by the Chicago, Milwaukee, St. Paul & Pacific.

A special report on foreign railway electrification, made up largely of material collected by H. F. Brown (Gibbs & Hill), was presented by L. W. Birch (Ohio Brass).

It points out that developments here and abroad have been essentially parallel, but that in Europe they have been promoted to a greater degree by the relatively higher price of fuel entailing the use of water power.

In France, the report states that the outstanding development is the application of commercial frequency (60 cycles) directly from the power network to the railroad contact system. Most of the electrification in France is at 1,500 volts d-c.

Of the 1,850 miles of state-owned railroads in Switzerland, 1,792 miles or 97.1 per cent are now electrified. The total electrified mileage in Switzerland is now more than 3,000 miles. The total energy used by the state-owned lines in 1955 was 1,118,000,000 kw-hr. Approximately 13 per cent of this is used for train heating.

In Italy, there are presently 3,497 steam locomotives and 1,500 electric locomotives, 282 m-u electric cars, 18 high-speed electric trains and 787 cars with diesel or other internal combustion engine drive.

Belgium, like Italy, employs 3,000 volts d-c and about 650 miles of track have been electrified with this system. However, Belgian engineers have decided to use single-phase commercial frequency for their colonial possessions in the Congo, in Africa.

In Spain, 3,000 volts d-c has been adopted, and 1,500-volt systems are being converted to 3,000.

In Holland much of the railway system was destroyed during the German occupation, but this has now been almost entirely rebuilt using the 1,500-volt d-c system. At present there are more than 900 miles of track electrified, comprising over 40 per cent of all the main trackage. About 85 per cent of the passenger miles and 80 per cent of the freight-ton-miles are hauled electrically.

German railroads suffered severe war damage but have been largely rebuilt. Most of the electrified lines use 15-kv, 16⅔-cycle, single-phase power, but serious consideration is being given to the use of power at commercial frequencies.

English suburban lines are operated at 600 volts d-c, though in a later decision, 1,500 volts d-c was adopted. More recently, a decision has been reached to employ commercial frequencies at 25,000 volts for nearly all future installations.

Sweden with little coal and ample water supply, has now electrified nearly all its railway system, as Switzerland has done, with 15-kv, 16⅔-cycle, single-phase power. Nearly 6,000 miles of track on more than 3,500 miles of route are now electrified.

The Portuguese State Railways have started the electrification of the double-track line from Lisbon to Entrocamento, a distance of 92 miles, with the ultimate extension to Oporto, a distance of 150 miles. The 25-vk, 50-cycle, single-phase system will be used.

The Turkish State Railways have started the electrification of 17 miles of the main line west out of Istanbul for suburban traffic. The 25-kv, 50-cycle, single-phase system will be used on this installation.

Data on inductive interference has been assembled by a Task Group and included in the report. The assignment of this Task Group involves the consideration of the inductive effects on communication circuits from various types of railway electrification systems, with particular emphasis given to the types using commercial frequencies and voltages as their power supply.

Since all United States installations involve other than direct commercial power supply to the trolleys, and reports are available on only one commercial supply electrification in Northern France, it has been found desirable to first consider the inductive effects of existing types of electrifications.

The requirements for distribution and contact systems and for locomotives employing commercial frequencies is encompassed in another section of the report. The included table covers recently built locomotives of this type.

The report was presented by L. B. Curtis (PRR), J. M. Trissal (IC) and S. R. Negley (Reading). In the discussion, it was emphasized that a considerable premium had to be paid for high speed. It was also stated that the effect of a single-phase load will have much to do with the future of electrification.

F. J. Corporon emphasizing the importance of knowing what to do in an emergency.

Safety

The report of the Committee on Safety deals with the grounding of tracks where flammable liquids are stored. It also deals with resuscitation from electrical shock and with the special requirements of pole-top resuscitation. The procedures are spelled out completely and carefully.

The report was presented by F. J. Corporon (C.S.S. & S.B.). There was no discussion.

L. E. Grant stating that pedestal liners can be restored once, but only once by metal spraying.

Welding

It is possible to restore pedestal liners profitably, according to the report of the Committee on Welding and Cutting. The procedure is critical, however, and the restoration can be made only once. Under some circumstances, it may be better to manufacture new liners.

Diesel engines with large aluminum pistons (12½ in. in diameter) do not function well with "economy" grades of fuel and are hard to start. The report states that some railroads have remedied this trouble by using automatic machine welding in a helium or argon-helium atmosphere to build up the central area of an aluminum piston crown to raise the compression to about 16:1.

The report was presented by L. E. Grant (C.M. St.P. & P.). One speaker taking part in the discussion spoke of two new types of electrodes which permit the welding of hard-to-weld steel and which avoid crack sensitiveness, common to other electrodes. One contains 30 per cent iron filings and the other 50 per cent, the latter being suited only to down-hand and horizontal welds. He said they make well-shaped welds with maximum strength.

Asked about the welding of broken diesel engine crankshafts, Mr. Grant said he doubted if it would be good practice. Mr. Fort said it was done on 900-hp engines during the war, and that they broke every time.

In the report on repair shops, presented by D. F. Dunsmore, proper repair of fuel injectors is called the most important maintenance operation.

Repair Shops

The greater part of the Report of the Committee on Repair Shops is made up of a revision and refinement of the 1955 report having to do with shop procedures and equipment.

As a new subject, the practice of high-potential d-c testing is given careful consideration, particularly with reference to its use on traction equipment. Concerning this subject, the report states in part:

Interest in the use of direct current testing has increased, especially its application to traction equipment.

Direct current high potential has for many years been used successfully to test large high voltage fixed property generators and motors. It permits the user in this field to have a relatively small test set which, with proper interpretation, will reveal the condition of the insulation. This in turn is used as a guide when to schedule removal of the equipment for overhaul or rewind. The interpretation of any one test is a combination of that test, past test and experiences and statistics.

Some railroads feel that d-c is a big step forward in improving the maintenance of diesel locomotive electric traction equipment and a means of increasing mileage between overhaul and rewind. The ideal will be a test which indicates when equipment must be removed from service. This is foreseeable in the very near future.

Some investigation has been made and technical papers written in the last year relative to the application of d-c overpotential testing of traction equipment. The bibliography lists some papers on this subject.

D-c overpotential test equipment in the size required (5,000 volts) for testing electrical traction equipment is small weighing approximately 15 lb. and costs less than equivalent a-c test equipment. Equipment is sensitive, permitting impressed voltage to approach point of breakdown without damage to insulation. Repeated tests, if test polarity is not reversed, are not harmful to insulation. With experience, best results can be interpreted to reveal the condition of insulation.

It is necessary to discharge windings after each test since windings retain a charge which can produce a shock on contact with windings. The test, because of the nature of d-c and the absorption and capacitance of insulation, is a long time test.

Accumulation of statistics and data by railroads and manufacturers using d-c test apparatus should be offered to the committee for evaluation and establishment of standards. The committee welcomes recommendations and comments from section members.

Various methods of cleaning electrical parts are described in the report. Their relative values are compared in a table.

The final section of the report consists of a bibliography of articles on diesel-electric locomotive repair shops. It shows that *Railway Locomotives and Cars* is the primary source of such material.

The report was presented by D. F. Dunsmore (C&O) and P. J. Sasgen (PRR). In presenting his section of the report, Mr. Sasgen said that the most effective means of minimizing costs of diesel-locomotive operation is proper maintenance of fuel injectors. Concerning the use of low-cost fuel, he said, equal or better savings can be made by improved fuel injection.

One manufacturer stated that high voltage d-c testing will not give the results expected for testing armatures and frames upon

receipt at the shop or for the final test before the motor or generator is released for service.

A question was raised as to why the d-c voltage used was 1.6 times the a-c voltage when the a-c crest was only 1.4 times the root mean square voltage. It was stated that 1.6 was an arbitrary value and not a ratio.

Concerning old generators, two operators said that if they can keep generators clean, there is no limit to their life.

A question was raised as to why insulation was tested at two times rated voltage, plus 1,000, and the only forthcoming answer was that it was a time tested figure.

It was pointed out that low-voltage equipment was tested at voltages that are higher than high-voltage equipment with relation to their rated voltages and one manufacturer said that low-voltage insulation has a greater factor of electrical safety because it must meet mechanical requirements.

Offering a correction to the report, Chairman C. R. Bland said that some things might be proper without being satisfactory.

Air Conditioning and Refrigeration

New developments reported by the Committee on Air Conditioning and Refrigeration included an electro-chemical humidity sensing device. The basis of operation of this device is the behavior of a hygroscopic salt in the presence of water vapor. This salt, sometimes lithium chloride, when exposed to the atmosphere under average room conditions, will absorb moisture and dissolve, forming a saturated solution whose moisture content is proportional to the moisture content of the atmosphere. This solution then becomes an electrolytic conductor between two otherwise electrically insulated elements and functions as a variable resistance, its ohmic value being determined by the moisture content. Thus this value becomes indicative of the moisture content of the atmosphere and can be used to operate further control.

To the knowledge of the committee members, there has been no application of this equipment to railway passenger cars.

Air conditioning equipment used on new lightweight trains including the tubular train, the RDC unit train, the Aerotrain, the Talgo train and Train X covered in the report has been described in previous issues of *Railway Locomotives and Cars*.

With reference to freon compressors the report states that the high speed refrigerant compressors of speeds from 1,200 rpm up are comparatively new to the maintenance man familiar with car air conditioning equipments. Only the past five years have seen these compressors in any reasonable number on railroad cars.

The advantages seem to lie in the absence of endless belts with the attendant pulleys, idlers, tension devices and economies of space requirements. On the opposite side of the equation are the coupling troubles, accelerated wear on all moving parts, the more critical lubricating requirements and noise problems.

The various types of refrigerant leak detectors are described in the concluding section of the report, special attention being given to an electronic detector. By introducing a small amount of refrigerant gas into an empty propane system, this detector has been used successfully to detect leaks in propane piping systems. The sensitivity of the device is such that it will detect losses equal to 1 to 20 ounces per year.

The report was presented by C. R. Bland (C&O) assisted by R. F. Dougherty (UP) and J. L. Christen (Pullman Co.). Manufacturer's representatives said that lubricating oil for compressors requires tighter specifications. They also said that wear of compressors is not increased by higher speed and gave assurance that high-speed compressors involve no unsolvable problems.

Users said this had not been proved in practice and asked if it would not be possible to reduce the cycles of loading and unloading. The use of an across-the-line starter was suggested. They also said they would be interested in reheat if there were a good humidistat. One manufacturer said that if a relative humdity of 30 to 50 per cent could be maintained, it would eliminate the need of a humidistat.

A user said he did not believe the claim that high-speed compressors produce less vibration and that wear at the seal was greater than with low-speed compressors. It is, he said, very difficult to maintain sufficient cleanliness when a seal must be changed in bad weather away from the shop.

A manufacturer told of an application in which reheat was being used without the need of additional equipment. It is done by operation of the overhead valve which is used in winter. A builder briefed a paper which explained that 227 high-speed compressors were placed in service in 1945 and that there are now 500 in service, giving no more than normal trouble. He predicted that speeds will go to 3,500 rpm. A user made a request for better accessibility.

One commentator raised a question of the difference between proper and satisfactory. A recommendation in the report reads, "Check if air flow is proper" and it was suggested that the word be changed to satisfactory.

A user stated that the life of a bearing is more influenced by the enclosure than by the fact that it is sealed or shielded.

The report of the Committee on Electric Heating presented by H. C. Cross was called a remarkable piece of original research.

Electric Heating

A questionaire sent out by the Committee on Electric Heating on standby heating of diesel-electric locomotives showed that the method enjoying greatest usage is the electric immersion heater directly installed in the diesel unit, while the next in usage is that of the oil-fired heater installed on the unit. These two methods accounted for 1,747 units reported, out of a total of 1,888.

Recently developed applications of electric heating applicable to railroad service referred to in the report are electric heaters for lightweight trains and the G.E. T-3 infrared quartz lamp in 500- and 1,000-watt sizes being used as a heat source for heating pinions, bearing races, couplings and such machine parts that are to be shrunk-fit on shafts.

The major part of the report consists of a thoroughgoing study of the economics of removing snow from track switches. Comparative costs are given in the table.

Comparison of Annual Recurring Expenses — 1953 Basis
200-hour use—1,000 feet of switch length

	Kerosene Pots	Propane Gas	Electric
Fixed charges:			
Interest, depreciation and insurance	$ 1,060	$ 8,350	$4,150
Operating costs:			
Labor, including annual removal	9,410	1,800	——
Supervision, overhead, food, etc.	1,880	200	——
Fuel, including handling and facilities	2,800	2,500	——
Electricity, including demand and energy	——	——	3,068
Maintenance, including overhead	200	3,245	600
Total recurring expense	$15,350	$16,095	$7,818

Several types of switch heaters were tried and the committee's findings concerning their relative merits are included in the report.

The concluding section of the report covers the economics of

supplying power for heating switches with electric power from a diesel-electric locomotive.

The report was presented by H. C. Cross (B&O), assisted by D. M. Burckett, (B&M) and L. B. Curtis, (PRR). During the discussion, mention was made of a device which would advise a headquarters point if snow was falling in distant places, and tell how much. It has been used by the U. S. Government. Chairman Gordon said the report constitutes a remarkable piece of original research.

R. C. Welsh, Jr. presented the Report on Power Supply stressing the requirements of increased standby power demand.

Power Supply

The design of supply lines for electrical facilities in coach yards and other locations is a subject being given new consideration in the report of the Committee on Power Supply. Increases in the capacity of utility company networks is requiring increases in the capacity of protective circuit breakers. Added costs are also incurred by the requirements for switch enclosures. Increased power demands of electro-mechanically air-conditioned cars are requiring increased feeder capacity. Running feeders across tracks, rather than parallel to them is recommended to save copper cost.

Two new types of rechargeable switchman's lanterns have appeared on the market and are being tested.

Standby power plugs filled with Silicone No. 4 compound have proved to be relatively free of trouble caused by carbonization and such a plug is described in the report.

The report was presented by R. C. Welsh, Jr. (PRR) assisted by G. L. Sealey (Reading) and C. R. Bland (C&O). During the discussion, it was said that standby power plugs made of insulating material were more popular than metal plugs and that some states do not permit the use of metal plugs. Mention was made of a new plug with removable contacts which will operate under 10 ft of water. Rhodium-plated contacts for plugs were said to effect a considerable improvement. Such plating increases costs about 35 to 45 cents per contact.

The possibility of having to provide 440-volt standby power for some of the lightweight trains was discussed and a manufacturer said his company had produced 220- and 440-volt plugs which could not be used in the wrong receptacle.

The practices of "recharging" switchmen's dry batteries and the use of storage batteries for flashlights were discouraged. Storage batteries for switchmen's lanterns are apparently making a better showing. The switchmen have objected a little to the increased weight, but they get better light and are apparently learning to like them.

A Roman candle type of explosion of a standby plug was described, and it was said that one source of such trouble was the use of cables that were too small, and that an explosion cannot happen when a plug is pulled if AAR clearances are maintained. No matter how fast or slowly a plug is pulled, it was said, the control contacts will operate the breaker.

Car Electrical Equipment

For those who are interested in the independent passenger car, the report of the Committee on Car Electrical Equipment covers all the recently-equipped cars which fall essentially into this category. This includes cars which require steam for heating, but are otherwise independent, and those which are completely self-sufficient. All can, if desirable, be supplied with standby electric power. The cars covered in the report include cars placed in service by the Santa Fe, Great Northern, Pennsylvania and Long Island. Only the Pennsylvania diners are supplied with waste product heat. Basic features of all these cars have been described in *Railway Locomotives and Cars*. The report includes additional information on power requirements as follows.

T. G. Isel presents the report of the Committee on Car Electrical Equipment.

Santa Fe and Great Northern Cars

The Budd Company has constructed 22 passenger cars which are provided with Caterpillar diesel engine-driven alternators for electric power supply. Fourteen of these cars are full length domes and two are experimental high-level cars currently in operation on the Atchison, Topeka and Santa Fe. Six additional full dome cars are operated by the Great Northern.

In all of these installations the engine alternator is located at one end of the car above the truck in an equipment compartment. With this arrangement, the unit is protected from the weather and is accessible for service while the cars are in motion.

The successful operation of the two experimental cars by the Santa Fe has resulted in the purchase of 47 additional high-level cars, using the Caterpillar power plant. Three car types are included in this group of cars, and they will make up five 9-car trains including coaches, lounge cars and diners. Improvements in radiator cooling, engine arrangement and roll-out features are embodied in these newer designs. The Caterpillar D-315, 40-kw engine alternators are used on the coaches while the Caterpillar D-318, 60-kw engine alternators are applied to the sky lounges and diners.

During the latter part of 1955 and in 1956, there were placed in service on the Long Island, a total of 80 coaches, equipped with individual undercar diesel engine-driven alternator sets to supply electrical energy for air conditioning, lighting and drinking water coolers on these cars.

The power plant consists of a 3-cylinder, 2-cycle, General Motors Detroit, diesel engine model 3096-D, rated 50-hp at 1,200 rpm, direct-connected to a 25-kw, 80 per cent pf, 230-volt, 3-phase, 60-cycle Delco alternator.

The Delco-Frigidaire power generator consists of two components—the 3-phase rotating field alternator, and the integral 1.8-kw, 38-volt d-c battery charging generator, both housed in the same frame.

The alternator voltage is regulated by a Frigidaire (Vickers) static regulator, consisting of a voltage detector, two stages of magnetic amplification, a negative feed back (stabilizing) loop, and over-frequency relay; also, current transformers for compounding.

The car electrical load can be carried on 220-volt, 3-phase, 60-cycle standby when the yard service is plugged into the car. A transfer relay has been provided to prevent operation from both power sources in parallel.

Pennsylvania Diners

The Pennsylvania has a total of 24 General Motors, Model 3096-D, Detroit diesel engine-driven undercar power plants for individual power supply on dining cars and coffee shop cars. There are two units per car, each unit rated 25-kw, 80 per cent pf, 230-volt, 3-phase, 60-cycle, 1,200-rpm direct-connected to a 2-cycle diesel engine. These units supply energy for air conditioning, lighting and all electrical appliances in the kitchen and pantry. The units are arranged for automatic paralleling. Waste product heat is obtained from the engine jacket water and from the engine exhaust gases to heat the car in the winter and to heat service water in the kitchen during the entire year.

These two power plants are identical as to diesel engine and electrical characteristics. The engines are arranged for separate starting. During the starting period, battery power is supplied to the alternator field. At a predetermined voltage, the battery switch is automatically opened and the a-c voltage regulator assumes control to supply d-c energy (rectified a-c) to the alternator field to obtain the proper regulated voltage. After one machine is on the line, the second machine can be started and will come up to

speed and voltage in a similar manner. The two units will automatically parallel without presynchronization because of the droop in the hydraulic governors and the droop in the voltage characteristics of the alternators.

Lightweight Trains

Complete data on electrical equipment for the Pennsylvania's lightweight, tubular train is included in the report. This was also covered in the July issue of *Railway Locomotives and Cars*.

Motor-Alternator Equipment

A major section of the report covers specifications for equipment for installations on passenger equipment cars. Other subjects covered include methods for testing Spicer clutches, a Gould battery cell filling device and manual revisions concerning trainline jumper cables and plugs, and jumpers for inter-call bell systems.

The report was presented by T. G. Isel (Pullman Co.), with sections by S. V. Smith (PRR), R. I. Fort (IC), and R. H. Russell (GN). One member wanted to know if connectors as long as 69 in. were needed between cars and it was explained that they were essential on some crossovers,—that a 59-in. connector would become 69 in. long after the cars passed over it.

A considerable amount of discussion was concerned with the method of testing Spicer clutches described in the report. Some members would like to have a procedure that could be used in the yard, it was generally agreed that yard tests should not be necessary.

A warning was given to those who are in the process of producing power cars to watch the weight of the car during the process of applying equipment.

One member said that the cell filler described in the report fills a long felt want.

Exact distances at which you can see lights and dark objects in all kinds of weather are shown in the Report on Illumination presented by G. L. Sealey.

Illumination

New light source developments referred to in the report of the Committee on Illumination include hard glass mercury and fluorescent-mercury lamps which are now available in 400- and 1,000-watt sizes,—mercury lamps in 100-, 175- and 250-watt sizes,—a 400-watt semi-reflector, fluorescent-mercury lamp, in which the color-correcting phosphor acts also as a partial reflector to redirect the light and a complete line of high output, rapid start fluorescent lamps in 24-, 48-, 72- and 96-in. lengths.

Distances at which objects and lights may be seen during day and night under varying weather conditions recently developed by the National Bureau of Standards and the Civil Aeronautics Administration have been summed up for railroad use by the Baltimore and Ohio. The accompanying table summarizes results of the study.

Day visibility of black object	Night visibility of 25 C.P. light	Atmospheric designation
137 ft	475 ft	Dense fog
343 ft	1,000 ft	Thick fog
686 ft	1,740 ft	Moderate fog
1,370 ft	3,000 ft	Light fog
3,340 ft	1.1 miles	Thin fog
1.3 to 2.2 miles	1.8 to 2.6 miles	Haze
4.3 miles	4 miles	Light haze
8.4 miles	5.6 miles	Clear
28 miles	9.3 miles	Very clear
Unlimited	15 miles	Exceptionally clear

Piggyback terminals have introduced some entirely new lighting requirements, particularly to provide for the tying down of trailers. A solution of this new problem is included in the report. The parking area, it states, should be illuminated to a value of one footcandle. Vertical surfaces of trailers should be lighted to make reading of numbers easy. An adequate number of wide-beam floodlights or street lighting type fixtures on poles at the edge of the ramp will give the required 5 to 10 footcandles for loading and unloading trailers. Light for trailer tie-down may be obtained by using reflector type lamps, mounted two feet above the platform.

Also, there is a description of the lighting of one of the country's newest and largest shops, the Pennsylvania's car shop at Hollidaysburg, Pa. Lighting intensity on the working plane in this 11½ acre shop is 35 footcandles.

High-frequency, 400-cycle power for fluorescent lamps, the report states, offer a number of advantages since it may reduce costs by reducing weight of ballasts and fixtures, produce increased light output at somewhat higher efficiency, reduce load on air conditioning systems, etc.

The report was presented by G. L. Sealey (Reading). Much of the discussion was concerned with the use of rapid-start lamps with switch-start ballasts. Generally, it was said, rapid-start lamps can be used with switch-start ballasts, but this will not result in rapid-start performance. The life of the lamp may be reduced by about 30 per cent by this arrangement. It may also result in overheating the ballasts.

P. B. Burley prophesies that the transistor will reduce train radio power requirements 20 to 30 per cent.

Radio and Communication Systems

Major functions of the Committee on Application of Radio and Communications Systems to Rolling Stock are to keep in close touch with work being done by the Communications Section of the AAR, and to coordinate its activities with the Car Electrical Equipment and Automotive and Electric Rolling Stock Committees. In this year's report the "Radio" committee has also reported on present day conversion equipment for communications radio power supply. Two types of such converters are used, namely, the rotating motor-alternator or motor-generator and the vibrating inverter. The report describes such equipment and adds that it should be noted that it is now possible to obtain communication units which incorporate power supply conversion equipment. These units may be connected directly to the locomotive or car direct current source. Although exact arrangements vary with the manufacturer, a vibrator is generally used in the conversion equipment.

Attention is called to the fact that in future designs of train radio communication equipment, the use of transistors will undoubtedly reduce power requirements.

Television applications, the report states, have been made in several business cars.

Power Supply Requirements,
Radiotelephone Common Carrier Service

Supply voltage, nominal	6-volt d-c	12-volt d-c
Supply voltage, limits	5.7 volts-7.5 volts	11.4 volts-15.0 volts
Current required, stand-by	11 amp.	6 amp.
Current required, "off-hook"	20-30 amp.	12-15 amp.
Current required, transmit	50 amp.	25 am.

Concerning power requirements for radiotelephone (common carrier service), the report has the following information to offer. Radiotelephones in common carrier service are in use today in such quantities as to make them common rather than novel or unique. In general, until recently the power requirement has been exclusively a 6-volt d-c system. Today a supply of either 6 volts d-c

or 12 volts d-c is satisfactory to most, if not all, telephone companies furnishing radio telephone common carrier service. In the table below are listed values and quantities that are representative of the situation in this country today.

The standby currents listed above may be found to be approximately 100 per cent higher than those published or reported elsewhere heretofore. The increased requirement results from a change in communication unit design from single channel to multiple channel. It is noteworthy that the space requirements for the equipment have decreased with the introduction of the multiple channel unit.

The report was presented by P. B. Burley (IC). One questioner reported having difficulty with inverters when operating from the battery with the car standing still and suggested that a low-voltage relay be used to drop out inverters, and prevent damage. The question was referred to the Committee of Direction for possible future study. Asked which was the better of the two types, Mr. Burley expressed the opinion that neither will be required within the next two years.

The potentials of magnetic amplifiers and transistors for radio service were outlined by C. R. Wadham.

Motors and Controls

Concerning motor developments, the report states that following in the wake of the new National Electric Manufacturers Association standards for a-c motors, which were reported last year, is a new suggested standard for d-c motors and generators. This is the result of a marked change in d-c motor operation over the years, and the new standards are expected to make d-c equipment better fit the applications it is now specified for.

Today's industrial d-c motors are generally used in conjunction with variable voltage motor-generators to obtain precise speed control for a wide range. Frequently a single generator and motor work together, and where several motors are connected to a single generator, the motors are located close to the generator unit to reduce distribution losses. Many small motor-generator sets located at load centers have replaced the large central power plants, and extensive constant potential buses of former years.

Insulation, the report states, continues to play an important part in motor progress. New developments in insulation compounds and new methods of applying present products are resulting in more power from smaller units. One new design has produced a 1/12 hp motor for oil burner service that weighs only 9½ lb, yet has the full starting torque of a ¼ hp motor.

During the last world war, it became evident the German warships were better able to withstand the shock of shell fire without loss of control than the ships of other nations. This was due to their use of magnetic-amplifier, rather than electronic or mechanical, controls. The magnetic amplifier is inherently well suited to rugged railroad service requirements. As applied to locomotives, it provides automatic control of current and voltage values without the need of moving parts. It is now being applied to power generator voltage control, caboose battery charging from three-phase generators, and temperature control.

The tiny transistor now used for hearing aids, miniature radio receivers, calculating machines, and many other applications is also finding its way into railroad service. In many cases, transistors take the place of electronic tubes and permit of smaller and more rugged control equipment.

The report was presented by C. R. Wadham (IC) and J. J. Schmidt (D & RGW). Mr. Schmidt announced that his railroad now has a magnetic amplifier in service on a sky lounge car. One speaker cautioned that if magnetic control is used for tape recorders, the sound circuit must be carried through transformers to provide for voltage drop.

It was also said that the magnetic amplifier, which is a static device with no moving parts, would be at least a part of the answer to Mr. Neuhart's dream of greatly simplified control equipment.

F. T. Snider presenting the Report on Wire, Cable and Insulating Materials.

Wire and Cable

The major part of the Report on Wire and Cable is concerned with revision of the Manual to be published in 1957. It also includes specifications for cable for battery charging and air conditioning service. These include two-conductor No. 2 AWG, three-conductor No. 4 AWG, and four-conductor AWG extra 0-600 volt cable.

The report was presented by F. T. Snider (PRR). The question was raised as to whether aluminum cable was suitable for inside wire. In reply a manufacturer said that this use of aluminum cable was not practicable because of the larger conduit needed for the aluminum cable.

The subject, however, will be further considered by the Committee of Direction for possible future study.

It was also brought out that aluminum cables had been tried for portable service, but that there was no reduction of weight because of the increased weight of the insulation required. It was further said, however, that under some circumstances the insulated aluminum cable will weigh less than copper cables with the same conductivity.

One member said there was a need for more development of aluminum cable terminals.

E. M. Hastings presented the Report on Relations with Public Utilities for John Leisenring who was disabled by a foot injury.

Relations With Public Utilities

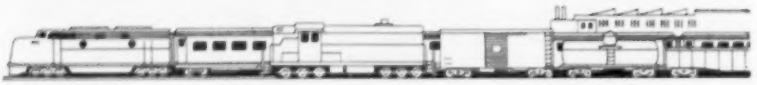
The report of the Committee on Relations with Public Utilities states that the possible effect of atomic power on the coal industry is of vital import to the railroads because coal is the largest single commodity carried by railroads in the United States. In summarizing the potentials of this situation, the report states that if electric generation by atomic power should develop at the predicted maximum rate to 1980, and total electric generation should reach only the predicted minimum, the coal industry would still have to supply over 60 per cent more coal annually to the power industry than it is doing today. On the other hand, if electric generation by atomic power should develop at the predicted minimum rate to 1980, and total electric generation should reach the predicted maximum, the coal industry would have to supply between four and five times the present annual amount.

The report also deals with wood preservation and with power contracts.

The report was presented by E. M. Hastings (C&O). One railroad representative predicted that power bills will get an unhealthy boost with the closing down of railroad power plants. Another contended that in the overall, the purchased power would cost less, because of the high cost of developing power in small isolated plants.

RAILWAY LOCOMOTIVES AND CARS

PROBLEM PAGE . . .



WHERE THE TOUGH ONES ARE HANDLED

A new question this month. Remember that it pays you to share your ideas and experiences with our readers. Submit letters to the Problem Page Editor.

What amount of time is required for monthly and annual locomotive inspections? How is the time divided between the various crafts, and what is the effect of additional manpower in reducing out-of-service time?

24-RL BRAKE LEAKAGE

With the first service feature cut out on a 24-RL brake pedestal, what would cause a loss of 5 or 6 psi pressure in the equalizing reservoir when the automatic brake valve handle is moved to the first service position? This is not normal, and the first service cut-out cock assembly was cleaned and checked, but did not solve the problem.

GASKET LEAKAGE? *by Air Brake Supervisor.* Assuming all leakage has been eliminated, for 24-RL brake equipment with pressure maintaining feature there could be a leaking gasket between the first service cock assembly and the filling piece connecting passages *24a* and *24*. In first service position equalizing reservoir passage *4* is connected to passage *24a*. Passage *24* connects with reduction limiting reservoir. With the defect existing, equalizing reservoir air is free to fill the reduction limiting reservoir, bringing about the "drawing off" of 5 or 6 psi.

In 24-Rl brake equipment without pressure maintaining, leakage past flat check *47* and ball check *46*, or gasket leakage could produce similar results.

ROTARY VALVE LEAK? *by H. V. Banks, roundhouse foreman, Camas Prairie, Lewiston, Idaho.*—as there is approximately $\frac{5}{32}$ in. of bridge separating ports *4* and *22* in the rotary seat, it is possible for a leak across the rotary valve to connect these ports in first service.

Assuming that an overspeed suppression valve is being used which receives its air in first service from passage *26*, and that the rotair valve is in freight position, the amount of air taken from the first suppression reservoir (110 cu in. in size) to operate the overspeed suppression valve would make possible a small reduction of the equalizing reservoir air from port *4* via the $\frac{5}{32}$-in. bridge.

Thereafter, the rate of reduction would be governed by choke *2* in the relay-air unit. The whole operation would be a close parallel to a normal first service reduction.

DO DIESELS START FIRES?

Can the responsibility for track-side fires ever be laid to diesel-electric locomotives?

(*Discussion continued from the July issue*)

MICHIGAN STUDIES THE PROBLEM, *by D. F. Weir, supervisor, Railway Fire Prevention, Michigan Department of Conservation.* In Michigan, reported diesel locomotive-caused forest fires increased from 8 in 1950 to 28 in 1952. After the close of the 1952 forest fire season we felt that a conference should be held for all those concerned with control. It was believed that a careful and complete analysis of the problem should develop some constructive recommendations for the control of these fires.

Accordingly, a conference was held at Milford, Mich., March 5 and 6, 1953. It was attended by representatives from the American Locomotive Co., the Electro-Motive Division of General Motors Corp., and Fairbanks, Morse & Co.; officials from the operating, engineering, and mechanical departments of nine railroad companies operating diesel locomotives in Michigan; representatives from the forest fire agencies of the United States Forest Service, the Wisconsin Conservation Department, and the Michigan Conservation Department.

The discussion of the many ramifications of the diesel locomotive as a cause of forest fires was sincere and frank. Every representative attending the conference was eager to contribute to the solution of the problem. The following general conclusions were reached:

1. That diesel locomotives cause fewer forest fires than do steam locomotives.

2. That ignited carbon deposits ejected from the diesel exhaust stacks are a major cause of right-of-way fires.

3. That carbon deposits formed in the diesel locomotive exhaust chamber are a residue of fuel oil combustion. When ignited, loosened, and ejected from the exhaust stack such deposits, if large enough to hold a high temperature until they land, set fires when forest fuels on the right-of-way are conducive to quick ignition.

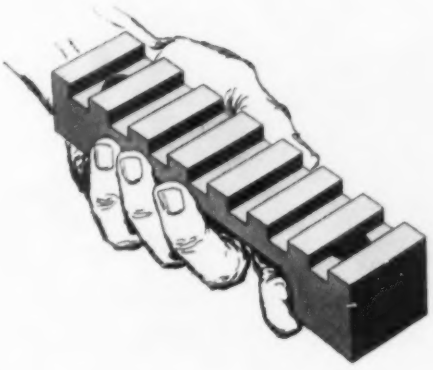
4. That detergents or other additives in lubricating oil used in diesel locomotive powerplants are not a serious contributor to the fire problem. Carbon deposits formed by these additives are small in size and of a flaky texture. When ignited, loosened, and ejected from the exhaust exhaust stack they are incapable of holding high temperatures for any length of time. The sparks called floaters,

(*Continued on page 80*)

How R-S JOURNAL STOPS will further

Reduce Solid Bearing Operating Costs

and pay for themselves in less than 3 years!



Tests have proved that this new device will greatly improve bearing performance and journal lubrication, will at least double bearing life, reduce wheel flange wear and make other significant savings in freight car operation.

STABILIZE the solid bearing assembly and you approach the maximum in bearing performance. You do just that with R-S Journal Stops. Best of all, they pay for themselves in less than 3 years. Here's how:

First, you reduce routine yard servicing and oiling requirements. Packing seldom needs adjustment, and you don't need oil so often either. (Other lubricators, pad or mechanical, will benefit, too). You cut car oilers' time in half, and inspectors' time by as much as 25%. When enough cars are Journal Stop equipped that could mean savings close to $18.00 per car per year.*

Second, all indications point to 3-year periods between periodic attention as required by Rule 66. That would cut current costs in half — save as much as $6.00 per car per year.

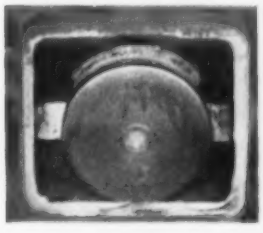
Third, and conservatively, you'll reduce road repair costs to a third of what they now are — possibly a great deal more. That means minimum savings of $6.00 per car per year.

Fourth, you'll cut bearing consumption in half — use less than 1½ bearings per car per year. In annual savings that will mean about $4.00 per car.

The above four items alone represent potential annual savings of $34.00 per car. Add to these the tremendous savings due to reduced wheel flange wear and a 3-year recovery estimate is probably conservative.

One private car company whose total savings are determined largely by billings that don't cover servicing costs, has already estimated recovery of total installation costs in less than 3 years. Operating roads will save even more. Write us today for full information. Magnus Metal Corporation, 111 Broadway, New York 6; or 80 E. Jackson Blvd., Chicago 4.

**These and other estimated savings are based on unbiased studies of AAR solid journal bearing operating costs.*



Unretouched photo of the RS Journal Stop installation with conventional waste packing. Other lubricators are similarly "contained."

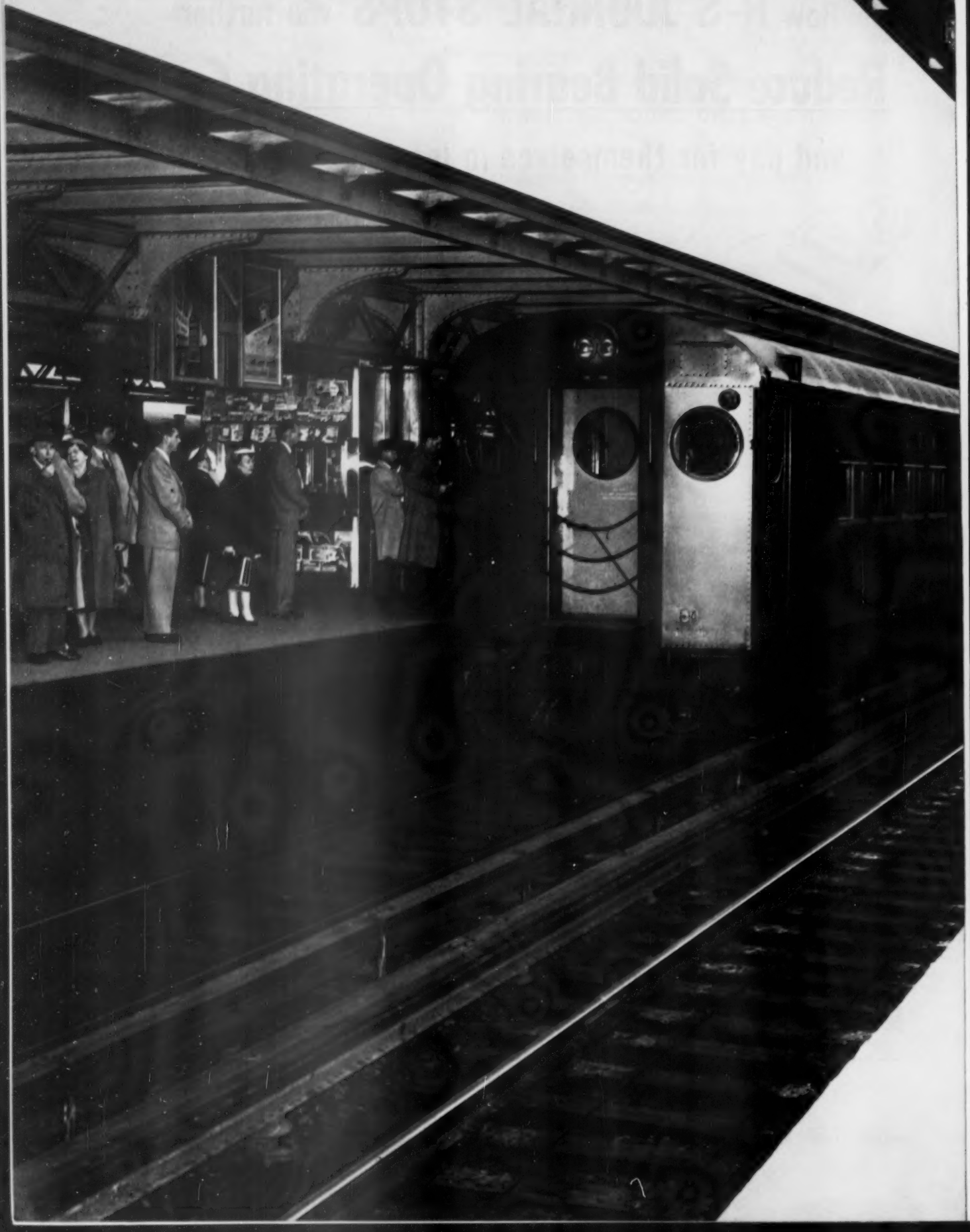
MAGNUS

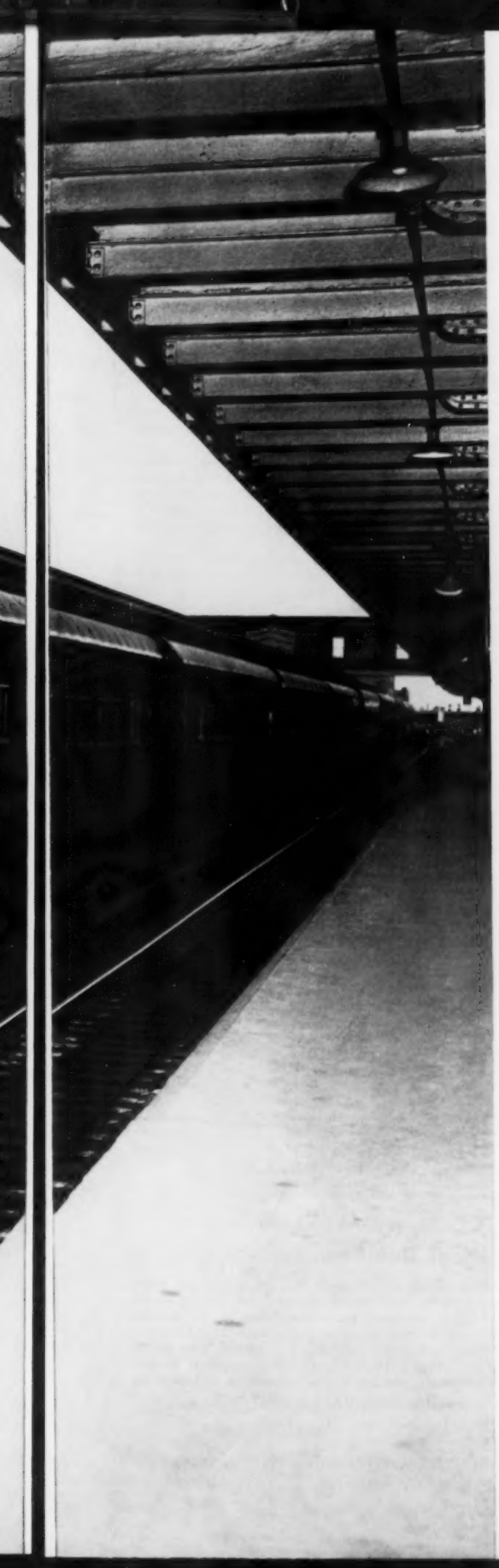
Solid Bearings

MAGNUS METAL CORPORATION

Subsidiary of **NATIONAL LEAD COMPANY**

KEY TO RAILROAD PROGRESS . . . ELECTRICAL PIONEERING





General Electric-Equipped Multiple-Unit Cars Provide Better Service, Lower Operating Costs for the New Long Island Rail Road

Seventy-four modern General Electric-equipped Multiple-Unit Cars, recently delivered to the Long Island Rail Road as part of a twelve-year, $60,300,000 rehabilitation program are providing better service and reducing operating costs. Each of these new cars is equipped with four high-speed G-E truck-frame-mounted motors which are capable of providing fast acceleration and higher schedule speeds. Passengers enjoy smooth, quiet performance. Proven equipment operation and reliability will greatly reduce maintenance costs and "out-of-service" time.

The Long Island, the nation's busiest passenger railroad, carries 285,000 commuters daily between New York and the rapidly growing Long Island suburban area. Ask your local G-E Apparatus sales representative for more information or write Section 135-4, General Electric Co., Locomotive and Car Equipment Department, Erie, Pa.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Problem Page

Do Diesels Start Fires?

(Continued from page 76)

and easily observed at night, are no doubt part of these ignited carbon deposits.

5. That, as far as has been determined, ignited carbon ejected from the diesel locomotive exhaust stack is formed by (a) improper setting or adjustment of the fuel oil jet which causes improper combustion; (b) the locomotive being operated for long periods with the [engine] throttle at or near idle, which causes a buildup of combustion residue in the exhaust chamber; (c) the residue from lubricating oil.

6. That certain types of railroad services are more conducive to the formation of carbon deposits than other types of services.

7. That the cause of carbon deposits being ignited, loosened, and ejected from the diesel locomotive exhaust stack are high temperatures in the exhaust chamber; high velocity of combustion gases ejected from the exhaust chamber; moisture in the exhaust chamber, which tends to loosen the carbon deposits.

8. The methods used for arresting ignited carbon deposits are (a) deflector or baffle plates placed at various positions and angles in the exhaust chamber; (b) a supercharger that breaks up by centrifugal force, ignited carbon deposits before they are ejected from the exhaust stack; (c) screened hoods placed over the exhaust stack.

9. Diesel locomotive spark-arresting devices have limitations: (a) The arrangement of deflecting or baffle plates in an exhaust chamber must not materially reduce the ratio between the area of opening of the [engine] exhaust ports and that of the exhaust stack or the [engine] will become overheated. (b) The height of any spark-arresting hood over an exhaust stack is limited because of the clearance necessary for the locomotive to move through tunnels, and under bridges, buildings, etc.

10. Train crews need fire prevention education. Representatives of the Wisconsin and Michigan Conservation Departments agreed that a properly worded forest fire prevention sign and ashtrays placed in the locomotive cabs and cabooses would be a good fire prevention measure. They also agreed to intensify efforts to educate train crews. (From *Fire Control Notes,* October 1953, p. 24. Published by the Forest Service, U. S. Department of Agriculture.)

Mechanical Division Meeting

(Continued from page 67)

maintenance inspection of the anti-creep feature in tightlock couplers, and with failures of couplers reclaimed more than once. Continued failures in the pin hole of the alternate standard swivel-shank Type E coupler have led the committee to recommend changes in the metal used. It was brought out less than 10 per cent of the coupler production of the last ten years has been this type, and that most are used in diesel switchers. One speaker said these couplers are difficult to inspect, and their manufacture should be discouraged.

Suggested for letter ballot by the Car Construction Committee is a complete ban on interchange service for cars having Allied Full-Cushion trucks. This action was protested by a carline owning a large number of cars with this truck. Their representative protested the statements "continued failures" and "inherent weakness" used by the committee in explaining the request for a ban. The truck is said to have operated over 100 million miles successfully with the heavier swing hangers. A committee member did point out that the Allied truck is difficult to inspect.

The committee has proposed new AAR classifications for bunkerless refrigerator cars and for box cars with lading devices. Several other new specifications and standards are incorporated in the committee report.

New Release Valve Rules

The committee recommended letter ballot action on two items:

1. That a tolerance of 1/64 in. plus or minus be established for the 1½-in. nominal outside diameter size for the portion of the shank of air brake hose, nipples and couplings around which the air hose clamp is applied.

2. That revision be made to four pages of the Manual to show a modification to the Type F No. 2 no-go gage, which will check for lip wear instead of guard arm wear (the modification itself was adopted by letter ballot action during the past year). Reasoning behind these changes is that present gages pass couplings that later contribute to leakage.

The committee recommended to the arbitration committee that a new Note 8 be added to Section (L) of interchange Rule 60 to require cleaning, oiling, testing and stenciling of brake cylinder release valve on cars so equipped when the air brakes are given periodic attention—also that a charge be established for this work under Rule 111.

Reason for making these changes is that brake cylinder release valve may now be applied in unlimited numbers to interchange cars.

The committee also recommended that authority be granted to apply an additional 5,000 Crerar, Adams brake cylinder release valves in addition to 5,000 already in service to compare this type valve with that of another manufacturer.

A sub-committee was set up with two other AAR commmittees to investigate the length and location of signal lines on cars with Budd design end sills and the location of angle cocks on cars equipped with Type F and H couplers.

A program is being instituted to check a new type single car testing device which was designed as a result of the change to the 1 lb per minute brake type leakage limit and which performs a more restrictive release test than has been possible before.

Group copies of revised specification No. 2518 on the installation of AB equipment were not ready at the last committee meeting. When the revised edition is ready, the secretary will prepare an announcement of the effective date for changes as they affect the foundation brake rigging details.

The effective date for the requirement that any automatic slack adjustors applied to freight cars must be of approved type has been extended from Jan. 1, 1956 to the same date in 1957. The variations in design of automatic slack adjustors caused difficulties in producing a suitable test rack.

The committee investigated jointly with the air brake manufacturers the possibility of incorporating into the present AB valve some features that appear to be desirable in the AC brake equipment. The incorporation was not considered to be possible.

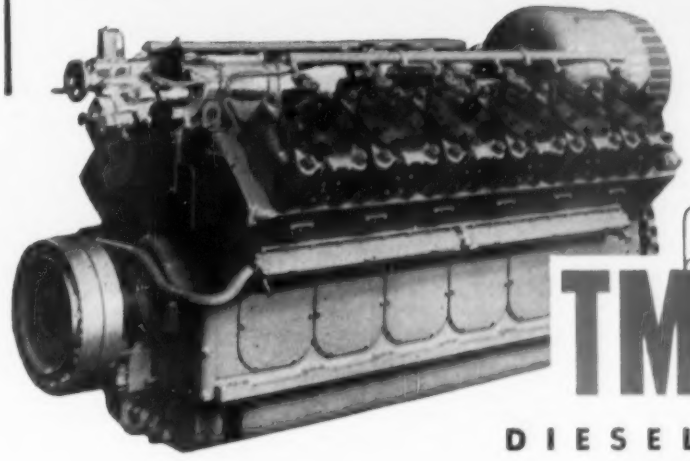
During the discussion the suggestion was made that brake cylinder release valves be equipped with only one release rod. Where there are two, one may be pulled by mistake and deplete all the air that has been saved.

New ICC Safety Appliance Regulations Due Soon

The Safety Appliance Committee has had a working group cooperating with the ICC Bureau of Safety and Service on the revision of safety appliance regulations. Many of the features of the ICC's original proposal were objectionable to AAR members, but many have now been resolved amicably. Some of the problems have been those of incorporating details of modern equipment into the regulations originally issued in 1911. It is ex-

(Continued on page 82)

DEUTZ



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DIESEL LOCOMOTIVES

powered by slow-speed 2-stroke DEUTZ diesel engines and equipped with hydraulic transmissions, for shunting and line service, with 4 to 12 cylinders, output ranging from 240 to 2000 HP

KLÖCKNER-HUMBOLDT-DEUTZ AG. KÖLN

(Germany)

Address inquiries from U. S. A., Alaska, Hawaii and Puerto Rico to: Diesel Energy Corporation, 143 Liberty Street, New York 6, N. Y.

Mechanical Division Meeting

(*Continued from page 80*)

pected that the revised regulations will be supplied to AAR members within a short time, and the committee invited their comments and asked for a thorough study.

Wood sheathing and wood construction introduce problems causing the committee to warn against painting over decayed running boards and dome platforms. Another trouble spot has been the bolts used on grab irons and ladder treads. They have frequently been found badly rusted where they run through the sheathing of refrigerator cars.

New Journal Oil Intended to Improve Summer Performance

Changes in the specification for journal oil have been recommended for letter ballot action by the Committee on Specifications for Materials. It calls for the viscosity to be changed from the present 50-55 seconds to 53-58 seconds at 210-deg F. This action was questioned by a spokesman for the Chicago & North Western who said that it might affect winter operation and could possibly lead to the reestablishment of winter and summer grade journal oils.

M. A. Pinney, Pennsylvania engineer of tests, said that this change in viscosity follows a change in the viscosity index from a minimum of 80 to a minimum of 100 last year. There is every indication that winter performance should be unimpaired while summer performance would be considerably improved. The decline in supplies of natural wool have led to a reduction in quantities available for journal packing, and the committee recommended that the specifications be changed to require only 80 per cent animal fiber.

Some changes in the specification for lined journal bearings have been made. One calls for rebroached bearings to be stamped with the letters RBD and the exact size. H. Nelson, mechanical superintendent for Fruit Growers Express, asked if this would apply to railroad and car line shops using brass trimming machine as well as to manufacturers. He was informed that the requirement would be mandatory. This committee concurred with the recommendation of a fuel for mechanical refrigerator cars prepared by the Committee on Lubricants and Fuel. One speaker said that the 20 to 40-hp engines used in the cars were protecting ladings sometimes worth over $40,000, and that quality should be kept up. Mr. Nelson of FGE said that lower grade locomotive fuels were unsuitable.

This committee is to decide jointly with the passenger car committee on whether Alcoa alloy 61S-T6 is a structural material suitable for passenger cars. It has a yield strength greater than 80 per cent of the tensile strength required by the material specification for new passenger cars. One speaker asked that there be no change in AAR specifications now because the present applications of this aluminum alloy are not involved in interchange service.

Trailer Tail Lights Must Be Covered

Among the changes the committee recommended for inclusion in the rules were:

Covering of red or amber lights or reflectors on truck trailers to avoid confliction with train operating lights or signals.

The use of common annealed wire midway between points of contact of loads with a long free span attached by high tension bands (for dampening purposes to prevent excessive vibration). The use of secondhand or reclaimed high tension bands, high tension wires, or common wires for such items specified in the rules and detailed figures would be prohibited.

A table of load strength of different size high tension bands to be modified to provide for additional sizes which have passed laboratory tests.

Suitable protective materials to be required between trailer tires and side blocking to prevent chafing and damage to tire walls.

Locking devices on the rotating members of rotating truck shovels and cranes and machines on which the boom rotates to be in the locked position. The commimttee hopes to have pamphlet MD-1 and possibly MD-4 revised to include the latest changes and ready for publication this year. Other recommendations range from new specifications and figures to minor editorial changes and supplementation of securement instructions and the addition of more details on securing methods.

During the discussion a letter was read from A. O. Smith telling that this large shipper liked the new horizontal method of loading auto body parts.

Lubricators, Stronger Floors and Cast Iron Wheel Ban Proposed

Recent AAR members' action approving mandatory replacement of loose waste with approved lubricating devices has resulted in the revision of parts of Interchange Rule 3 recommended by the Arbitration Committee. Previous letter ballot action has also led to recommended revisions requiring stronger flooring and floor supports for new box cars built after January 1, 1957, and to changes in methods of reinforcing freight car center sills.

A proposed new rule—Interchange Rule 28—specifies the fuel which must be provided for the engines of mechanical refrigerator cars. These mechanical cars have also necessitated several other interchange rule revisions. Specified are methods of handling and charging for repairs to the refrigeration equipment.

Letter ballot action has been recommended on a change in Rule 3 prohibiting the use of cast iron wheels on new or rebuilt cars after January 1, 1958. A modification of Rule 98 has been proposed facilitating the removal of this type of wheel from covered hoppers without undue expense to the handling line. Another letter ballot item would allow for group billing instead of the separate billing repair cards for single entry items of repairs of air brake hose, brake shoes, brake shoe keys, and cotterkeys renewed separately.

Cars built new after 1957 would be required to have AAR-approved truck side frames. To provide for more clearance over car retarders, no part of a new or rebuilt could be lower than 2¾-in. over the rails after 1957. Present limit is 2½-in. An extensive change in Rule 112 covers classification of new and rebuilt cars necessitated by changes in ICC regulations.

Repair track operations could be affected by changes such as one permitting the substitution of any approved metal brake step or running board if the original type is unavailable and if mounting arrangement is suitable, and a change requiring the cleaning and grease lubrication of center plates whenever a car is jacked off its trucks. Another would require the cleaning of the brake cylinder release valve along with the remainder of the brake equipment when a car is so equipped. Lock nuts or unit nuts would be required in securing AB brake valves, brake cylinders, brake reservoirs and pipe clamp supports according to a proposed revision of Rule 64.

New Lumber Loading Successful

In addition to specific recommendations on individual items the committee reported on the special method of handling lumber described in last year's report (the method eliminates full length side stakes, using end bulk head flat cars with the lumber covered by a plastic sheet). Over 150 experimental shipments of packaged lumber by this method indicated the adequacy of it and a new Fig. 9-B has been adopted to cover this type loading. This figure will become part of pamphlet MD-3.

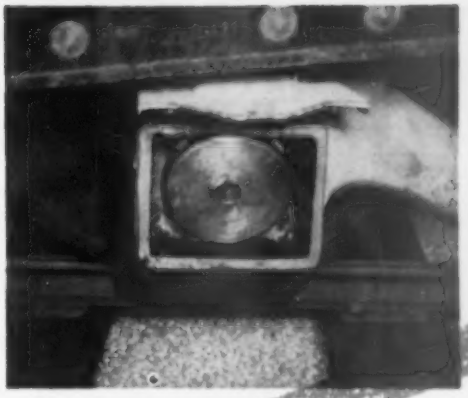
The committee quoted examples showing the value of permanent end bulkhead flat cars in handling packaged lumber and pointed out that such a car should not be considered special equipment as it can handle 95 per cent of all commodities that ordinarily move on to conventional flat cars.

A proposed revision of Fig. 9-A and Supplement 1 of Pamphlet MD-3, which would eliminate the use of stakes and rely entirely on high tension bands, is being explored further. The committee also recommended revisions to General Rules 9 and 15 and to Fig. 6, 9-B and 14.

The discussion centered largely about advocating two things—wrapping finished lumber to permit mechanized loading and more usage of fixed-end flat cars. The latter was reported to have eliminated the problem of endwise shifting of lumber, timber, and wallboard.

Simple The "Redipak" lubricating pad is a square block of foam neoprene, molded with cored passages and covered with cotton wicking material. It is installed—without any other packing—in the standard journal box without jacking the box.

Foolproof The square "Redipak" lubricating pad is fully symmetrial—it can be installed any side out, either face up. It can be inserted by hand or with a "Redipaker"—a simple bent rod which speeds up the work—and is removed with a standard packing hook.



Stop Hot Boxes!

"Redipak" Lubricating Pad points the way towards elimination of the hot box problem

Cool-running The "Redipak" lubricated bearing has operated as much as 50°F. cooler than waste-lubricated bearings, under certain conditions. In laboratory starvation tests, with no free oil in the box, the "Redipak" retained enough oil for 10,000 miles of high speed operation.

Long-lasting In service tests, "Redipak" lubricating pads have operated over 90,000 miles each, without noticeable wear. No pad has shown any sign of glazing. Inspection of the bearings shows that the pads do not lint.

No waste . . . with "Redipak"!

AMERICAN
Brake Shoe
COMPANY

NATIONAL BEARING DIVISION
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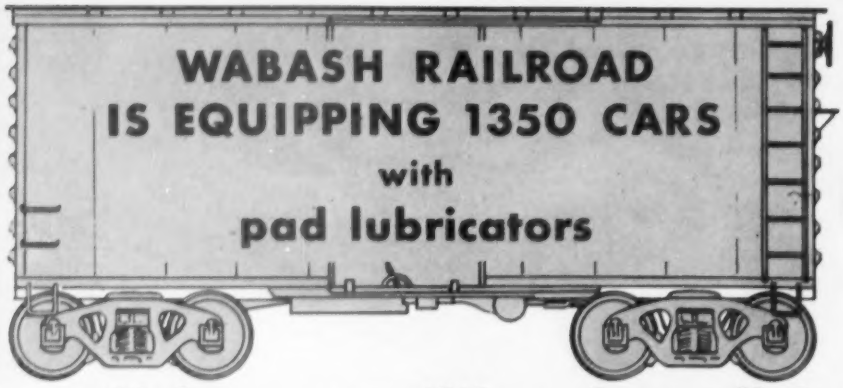
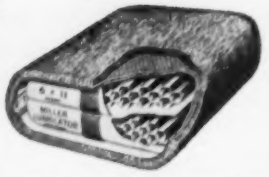
For Progressive Railroading



MILLER



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- *Volume quantities—immediate delivery*
- *Cost—$40 per carset (for all sizes)*
- *Life expectancy—6 years*

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Be sure to get the facts on the
IMPROVED CURTIS
Heavy-Duty Two-Circuit
Charging and Discharging
BATTERY CUBICLE

Learn how —

- You will "shop" a greater number of batteries . . . with greater accuracy and less handling.
- Your battery life will be greatly extended through proper handling — faster and at reduced cost.

CURTIS DEVELOPMENT & MFG. CO.
3254 North 33rd Street Milwaukee 16, Wisconsin

Railroads using a grease containing Moly-Sulfide on journal bearings have accomplished a notable reduction in HOTBOXES, because...

Moly-Sulfide Extends Effective Lubrication

when normal hydrodynamic oil film is wiped away

Hotboxes have been reduced materially in field tests by three leading railroads.*

Engineers of these roads are lubricating journal boxes with a supplemental grease containing Moly-Sulfide additive, which is applied direct to the journal during the normal servicing of the box.

The railroad industry pays an annual bill of about $90 million resulting from some 183,000 "hot boxes". The experience to date of these railroads indicates that Moly-Sulfide may provide a way to cut this expense substantially.

Moly-Sulfide appears to form a lubricating film on the journal and bearing. When a shock load or shearing action displaces the hydrodynamic film, the Moly-Sulfide film sustains effective lubrication until the petroleum film is restored.

This ability to extend effective lubrication is being tested by railroads in other critical applications, such as ball and socket joints of couplings, diaphragms, center plates, cylinder test cocks, traction gears and other parts of diesel locomotives, and on several points of car trucks.

You may obtain (1) more facts on how Moly-Sulfide functions as an additive, and (2) sources of railroad greases containing Moly-Sulfide by using the coupon below.

*Names on request.

Use the moly key ...to lubrication insurance

CLIMAX

- Films on metal
- Low shear strength
- High film strength
- Non-Corrosive

Resists:

- heat
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Department 59

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Please send me the following:

Literature

- ☐ "Moly-Sulfide, Lubricant Additive"
- ☐ "Moly-Sulfide in Chassis Grease"
- ☐ "Moly-Sulfide Specification and Properties"

Lists of Sources for

- ☐ Railroad Greases
- ☐ Chassis Greases

Sample — One-ounce tube of Moly-Sulfide ☐

Name _____ Position _____

Company _____

Address _____

"Here are answers to your questions about C-1 Truck performance..."

"Have any inspections been performed on C-1 Trucks by impartial observers after the trucks had been in service over a long period?"

"Certainly. One inspection, for instance, was performed on a group of C-1 Trucks that had been in regular freight service over 6 years."

"Under what conditions was the inspection performed?"

"Side frames were removed and 15 separate examinations made. Component parts of the friction control mechanism were checked for proper functioning and wear-life . . . journals, journal bearings, wedges and lids were examined for general condition."

"Who witnessed the inspection?"

"The inspector and six other men: superintendent of motive power, shop superintendent, master mechanic, special engineer, car foreman and gang foreman."

"What did these railroad men say about the C-1 Truck?"

"The inspector commented: 'conditions found were remarkably good . . . all personnel were well pleased with the condition of the truck and all parts.'"

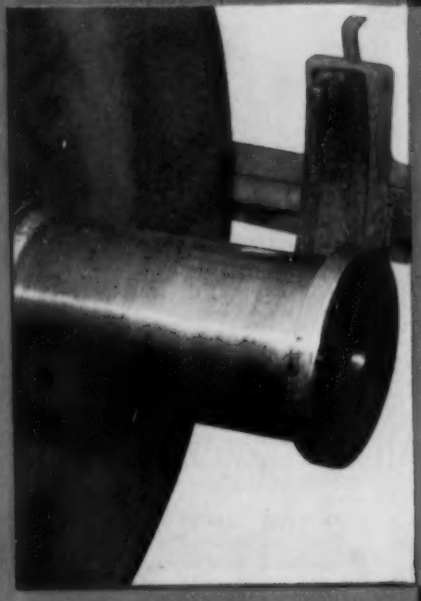
"How much maintenance was required?"

"From conversations with various personnel, it developed that maintenance has been almost nil. This, and other inspections, add up to convincing proof of the good service, proper functioning and longer wear-life of National C-1 Trucks."

"Sounds pretty convincing to me. Do you have specific data to back up your claims?"

"We certainly have. Let me show you these unretouched photos of actual parts . . ." AA-3395

"This photo shows the original axle. Note that there are no signs of abnormal wear and that its surface is smooth. Furthermore, wheel flanges were in good condition and the tread was not concave."

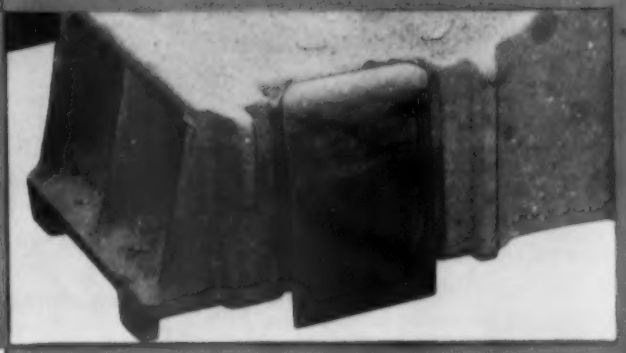


"This large, even bearing area in the side frame pocket shows that the 'rocking' motion of the wedge in the pocket reduces wear on both surfaces. These C-1 *facts* all add up to a better-riding truck that cuts wear and tear on equipment and track . . . keeps maintenance costs 'way down."

"Here the friction wedge is retracted into the side frame column. Here, too, you can see the *full-bearing surface* of the wedge. And the condition of the side frame column wear pad shows minimum contact with bolster lugs."

"You can see the stability of the C-1 friction control mechanism in this picture since the friction control wedge bears against this plate. Pay particular attention to the *uniformity of contact* shown."

"First, note the smooth journal bearings and minimum wear on journal bearing wedges where they contact the journal box roof. No line of contact between load spring coils shows that load springs did not go solid."



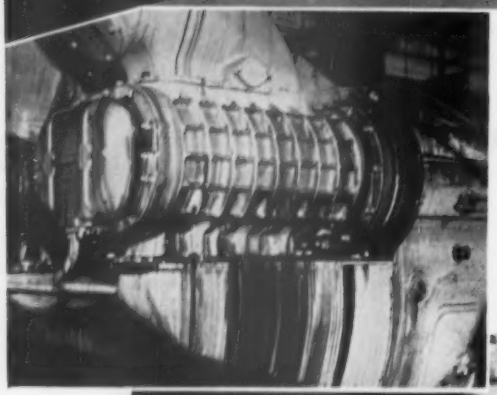
"The convex side of the friction wedge has a full-width bearing where it bears against side frame pockets. There's no evidence of scoring or gouging . . . just a smooth 'polishing' action. And the wedge spring is always in view so you *can see* that it is functioning."

NATIONAL MALLEABLE and STEEL CASTINGS COMPANY

Cleveland 6, Ohio

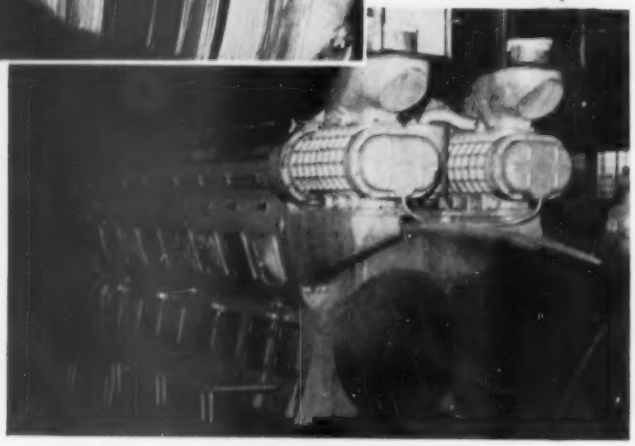
COUPLERS · YOKES · DRAFT GEARS · FREIGHT TRUCKS · SNUBBER PACKAGES · JOURNAL BOXES and LIDS

CLEAN 16 cylinder E.M.D. engine in only 40 minutes with reduced LIX DIESEL KLEAN HEAVY



Just spray on reduced Lix Diesel Klean Heavy and watch the soil roll off.

Then rinse with warm water, air blow, and it's ready to paint.



Leading railroads say . . . "Nothing cleans faster or better at less cost, than reduced Lix Diesel Klean Heavy."

LIX CLEANERS were laboratory developed and tested, then field proven by years of use in many leading railroad shops.

Fewer man hours per job means greater volume of work without additional labor. LIX reduces the usual necessary cleaning time to a minimum.

Since LIX cleans better in less time the result is substantial savings in labor and material costs . . . exactly what progressive railroads are seeking.

If you want to get better results . . . save valuable hours, labor and material costs, then investigate LIX. We will gladly demonstrate in your shop.

Lix Diesel Klean Heavy is non-toxic by Interstate Commerce Commission test standards.

Manufacturers of Lix Diesel Klean Heavy and Lix Electric Equipment Cleaner

THE Lix CORPORATION (OF MISSOURI)

PRODUCTS OF RESEARCH

716 EAST 85TH STREET, Dept. RL-8
KANSAS CITY, MISSOURI

"Leadership in Industrial Cleaning"

SUPPLY TRADE NOTES

(Continued from page 26)

search, succeeding *Dr. L. E. Lighton*, retired. *Edward L. McCabe* has been appointed assistant sales manager, Philadelphia branch, and *George L. Nicholls*, branch manager at Seattle, Wash.

■

C. F. Hammer

WESTINGHOUSE AIR BRAKE COMPANY, Air Brake Division.—*C. F. Hammer*, assistant director of engineering, has been appointed director of engineering at Wilmerding, Pa.

■

MORTON MANUFACTURING COMPANY.— *Henry W. Kreifeldt* has been appointed sales manager. Mr. Kreifeldt was previously sales engineer.

■

JOY MANUFACTURING COMPANY.—*John P. Cartwright*, Washington, D. C., district manager, has been appointed sales manager, industrial sales.

■

HUCK MANUFACTURING COMPANY. —*Robert H. Butt* has been appointed manager of the field engineering department. *Daniel D. Hicks* has been appointed field engineer for the Florida area.

■

BRANDON EQUIPMENT COMPANY.—*Paul O. Christy*, Railway Exchange building, St. Louis, has been appointed the Brandon sales representative on railroads in the southwestern territory.

■

W. H. MINER, INC.—*W. J. Trongeau* has been appointed to the newly created position of vice-president-sales.

■

VAPOR HEATING CORPORATION.—*Arthur J. Loose* has been elected vice-president.

■

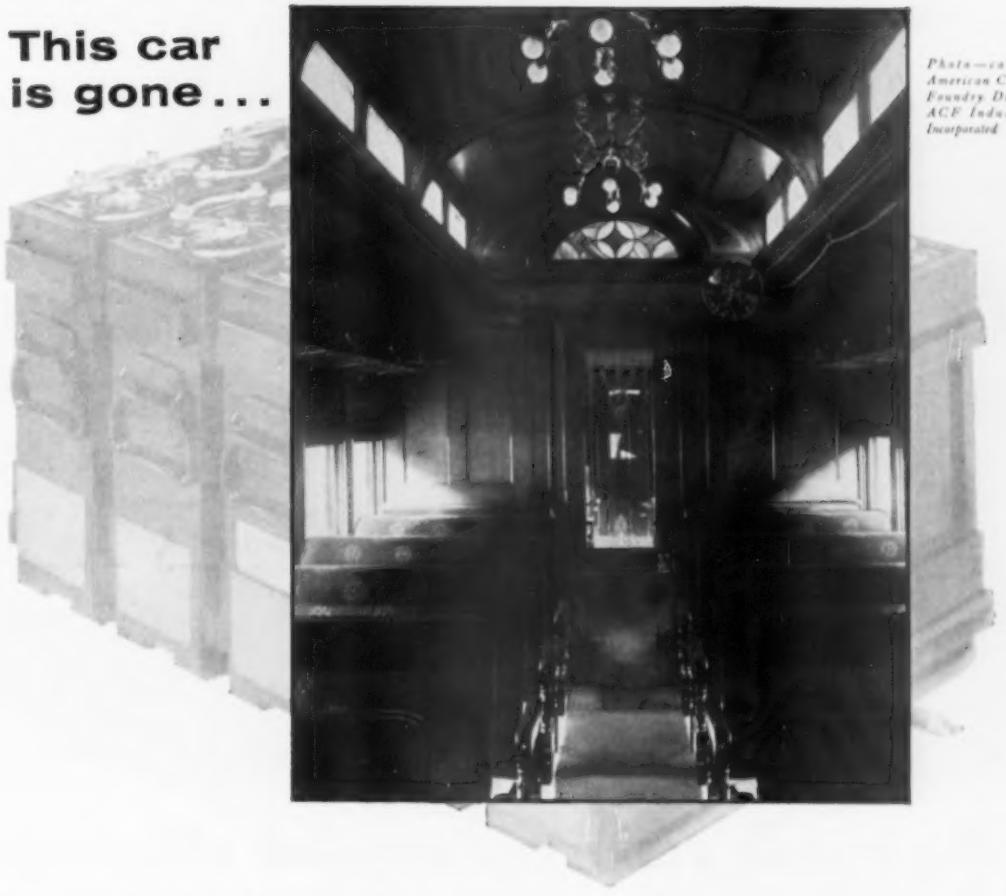
PHILIP CAREY MANUFACTURING COMPANY has appointed *F. W. Evinger* manager of railroad sales for both Carey and the *Lehon Company* products, with office at Bellwood, Ill. Mr. Evinger was formerly supervisor of railroad sales for Lehon.

■

NATIONAL ALUMINATE CORPORATION.—*J. A. Holmes* has been electric president, succeeding *H. A. Kern*, who

(Continued on page 92)

This car is gone...



Photo—courtesy American Car and Foundry Division ACF Industries, Incorporated

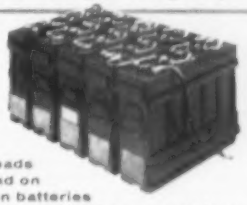
but its battery is still in service today!

RAILROADS have consistently reported a high average life for the EDISON batteries they use. In the case of one railroad, service life averaged 26.18 years: in another, 18.04 years: still another averaged 22.4 years—and one battery was 40 years old! *Proof that* EDISON *batteries last far longer than other types!*

In addition, it is possible to further extend the useful life of an EDISON battery by decreasing the load requirement. For example, a 110-volt EDISON battery which has had a normal service life on an air-conditioned car, can be reassembled into 32-volt batteries for use under lesser load requirements, such as a head-end car. Many car-lighting batteries have been transferred to smaller load duties such as a power source for railway caboose communication thus giving many additional years of dependable and unfailing service.

Throughout their long service life, the exclusive design of EDISON batteries protects you from "sudden failure" due to physical or operating abuse. This is another reason why you can rely on EDISON for superior performance and lower operating costs.

For further information, call your local Edison sales engineer or write Edison Storage Battery Division Thomas A. Edison, Incorporated West Orange, New Jersey



Railroads depend on Edison batteries for four important power services

• operating power on industrial trucks • stand-by power for communications equipment on caboose cars • stand-by power for air conditioning and lighting on passenger train cars • stand-by power for all types of railway signaling

You get more dependable power—lower over-all cost with

EDISON
NICKEL – IRON – ALKALINE
STORAGE BATTERIES

Railroads report improved efficiency and reduced maintenance with ALCO MODERNIZATIONS

Railroads throughout the country are taking advantage of ALCO kits to modernize their motive power. Many are applying the modernizations as a package – locomotive by locomotive–during regular scheduled locomotive overhauls.

Reports from these railroads show that ALCO *modernization material applied to engines in service has resulted in more efficient utilization of these locomotives and eliminated some costly maintenance problems. Modernization has brought these engines up-to-date, to the point where they can match the performance of those now coming from production lines. In many cases, the modernization has been achieved during normal overhaul periods, and it has increased time between subsequent overhauls.*

Your ALCO motive power can also benefit from the application of modernization parts. Contact your nearest ALCO sales office for complete information, or write P. O. Box 1065, Schenectady 1, New York.

ALCO

ALCO PRODUCTS, INC.

NEW YORK

Sales Offices in Principal Cities

AVAILABLE MODERNIZATIONS AND MODIFICATIONS

Listed below are a few of the important ALCO modernizations which can mean increased efficiency in your ALCO R44 engines:

ALCO water-cooled turbocharger — more efficient, responds rapidly to changes in speed and load, easy to maintain.

Ni-Resist exhaust manifold — reduces casting growth and failures.

Cylinder heads — strengthened with additional metal to distribute stress more uniformly, makes possible use of valve-seat inserts.

High-pressure fuel injection with snubber valve — more complete fuel combustion, lube oil condition improved, line erosion reduced.

Ni-Resist insert pistons — top ring-groove wear reduced, increases ring mileage.

Grooveless and partially grooved engine bearings — oil film thickness and load-carrying capacity increased.

Hardened, chrome-plated crankshaft.

Serrated cylinder blocks — eliminates fretting at joint surface of saddle and cap, prevents distortion and misalignment.

Oil-bath filter — maintains high efficiency over 95 per cent, reduced filter maintenance, reduces engine wear.

Simplified amplidyne control system — fewer parts in system with simpler circuits, maintenance reduced.

who called the railroads a "monopoly"??

by Hungerford

We will be glad to send you enlarged copies of this Hungerford cartoon (without advertising copy) for posting on your office and shop bulletin boards, or a cut for your company magazine, at cost.

Edgewater Rolled Steel Wheels

for Freight Cars Passenger Cars Diesel Locomotives

Edgewater Steel Company
PITTSBURGH 30, PA.

FRAHM® and JAGABI®
Speed Measuring Instruments
. . . to meet every requirement
Write for Bulletin 35-X
MEGGER®
Electrical Resistance
Measuring Instruments
. . . for all electric, Diesel-electric locomotives and other electrical equipment testing requirements.
Write for File RR #1
JAMES G. BIDDLE CO.
Electrical & Scientific Instruments
1316 ARCH STREET, PHILADELPHIA 7, PA.
BE SURE YOU'RE ON THE RIGHT TRACK
ALWAYS SPECIFY

continues as chairman of the board of directors. *R. G. Bielenberg* has been appointed assistant vice-president, and Paul E. Dempsey succeeds Mr. Bielenberg as manager of railway service.

■

AMERICAN HOIST & DERRICK CO.—*Hugh Piper*, formerly with Hillsman Equipment Company, has joined American Hoist as a special sales engineer serving railroads with Chicago terminals.

■

SPERRY RAIL SERVICE.—Westinghouse Electric's Type FE-1 railroad communications radio has been acquired by Sperry, who will manufacture, market and service the equipment as the Sperry Radio System.

■

FINE ORGANICS, INC.—The *Virginia-Carolina Safety Equipment Company*, Waverly, Va., in charge of *O. P. Baird*, has been appointed exclusive sales representative for Fine Organics safety solvent and aviation chemical products.

■

L.O.F. FIBERS COMPANY.—*H. Richard Harper* has been appointed manager of industrial sales, with headquarters in Toledo. Mr. Harper was formerly manager of equipment sales.

■

GARLOCK PACKING COMPANY.—*Phil Arnold*, vice-president, has retired.

■

UNION CARBIDE & CARBON CORP., *National Carbon Company*.—A new basic research laboratory for the study of chemical and solid state physics will be opened on September 18 in Parma, Ohio.

■

CRANE COMPANY.—*J. W. Greene*, district sales manager of Crane Company, at Long Island City, N. Y., has been named director of industrial sales at Chicago. *W. A. Burbine*, district sales manager at Chicago, has been made director of heating sales there. He has been succeeded by *Thomas D. Kelly*, Chicago branch manager. *Darrell R. Nordwall*, Los Angeles branch manager, has been made manager of the east coast district, and *Charles H. Lovelace*, Detroit branch manager, named manager of valve and fitting sales.

■

METAL & THERMIT CORPORATION.—*A. James Fisher*, technical advisor to the president, has been appointed general sales manager.

NATIONAL-U. S. RADIATOR CORPORATION-UNION ASBESTOS & RUBBER COMPANY.—An agreement has been signed between National-U. S. Radiator of Johnstown, Pa., and Union Asbestos of Chicago, transferring the Air Conditioning business of the latter to National-U. S. Radiator.

■

SYMINGTON-GOULD CORPORATION.—*George T. Paraschos*, manager, New England sales, has been appointed vice-president, New England sales, at Boston.

■

FAIRBANKS, MORSE & CO.—*Robert H. Morse, III*, sales manager, has been elected vice-president-sales. *J. F. Weiffenbach*, chief product engineer, has been elected director of engineering.

■

AMERICAN STEEL FOUNDRIES.—*Richard T. Coyne* has been appointed district sales manager at Denver, succeeding *F. H. Bassett*, deceased. Mr. Coyne was formerly assistant to the president, National Motor Bearing Company.

■

AMERICAN CHEMICAL PAINT COMPANY.—American Chemical has opened an office and factory in St. Joseph, Mo., to serve a new central territory.

■

OKONITE COMPANY.—*Rhea P. Lapsley*, sales manager of the Wilkes-Barre division, has been appointed vice-president in charge of research and product development.

■

YOUNGSTOWN SHEET & TUBE CO.—*R. P. Broadhurst* has been appointed sales manager of the Chicago district and *C. Hix Jones* sales manager of the Dallas district, the latter succeeding *Frank D. Carroll*, retired.

■

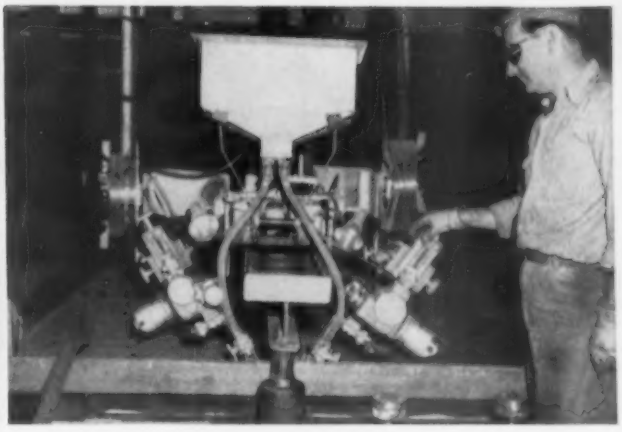
ALCO PRODUCTS, INC.—*R. Tom Sawyer*, research manager, has been appointed consultant on engineering and development problems. *Theodore Gupton*, manager Kansas City, district, has been appointed district manager at Houston, Tex.

■

VAN DER HORST CORPORATION OF AMERICA.—*Frank L. Jorstad* has been appointed sales engineer for the midwest territory, with headquarters at 2610 South Shields Avenue, Chicago.

A. J. Fisher

F. L. Jorstad



Above left: service-worn hopper car ready for dismantling by oxy-acetylene torches. Above right: double-head UNIONMELT welding machine joins stakes to side plates in fabrication of new car sides.

Saved! 393 TONS OF STEEL

By using UNIONMELT welding to fabricate new sides for 3,477 service-worn hopper cars, the Reading Company effected a steel saving worth $62,000.

High speed, deep penetrating UNIONMELT welding made it possible to eliminate lap-joint construction in the hopper car sides, and thereby reduced steel consumption approximately 226 lb. per car.

INCREASED PRODUCTION SPEED

In addition, automatic UNIONMELT welding machines averaged welding speeds up to 45 in. per minute . . . considerably faster than speeds possible by other fabricating methods. Completed welds are clean and sound.

SIMILAR SAVINGS

Using UNIONMELT welding, it is possible to save time and material in fabricating and reconstructing all types of rolling stock. Get detailed information on LINDE's modern methods for joining metals . . . call your local LINDE representative today.

Ready for years of additional service . . . this hopper car is one of 3,477 with new UNIONMELT welded sides.

RAILROAD DEPARTMENT

Linde Air Products Company

A Division of Union Carbide and Carbon Corporation

30 East 42nd Street UCC New York 17, N. Y.

Offices in Other Principal Cities

In Canada: LINDE AIR PRODUCTS COMPANY
Division of Union Carbide Canada Limited, Toronto

"Linde," "Unionmelt," and "Oxweld" are trade-marks, and "Ribbonrail" is a service mark of Union Carbide and Carbon Corporation.

Supplying to railroads the complete line of welding and cutting materials and modern methods furnished for over forty years under this familiar symbol . . .

NOW. MINER

New

CLASS FR-20–18

20⅛" LONG

CERTIFIED BY ASSOCIATION

CLASS FR-24–58

24 5/8" LONG

RUBBER DRAFT GEARS

We present two all-rubber gears, each with a rated capacity of 34,875 ft. lbs. at 2¾" travel accomplished at pressures that can be safely transmitted through the coupler shank.

These gears meet tomorrow's demands for the utmost in lading protection, and the compression characteristics of the patented Miner rubber unit will provide slack-free train operation for years and years.

Assembled in lengths of 20⅛" or 24⅝". Meeting every new car, rebuilding, or replacement requirement.

No followers needed with the FR-24—58 design. The FR-20—18 Gear uses two follower plates, which are ofttimes available in railway stocks.

Designed and service-tested to eliminate lading damage and save railroad funds.

Manufactured as self-contained units, precompressed for easy application to cars or locomotives.

W. H. MINER, INC. CHICAGO

OF AMERICAN RAILROADS

F.O.-128

(low toxicity—high flash)

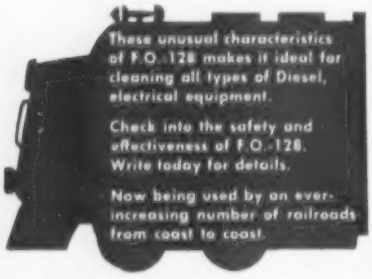
for all DIESEL
ELECTRICAL EQUIPMENT

FINE ORGANICS
'SAFE-TEE'
SOLVENTS

F.O.-128 does away with carbon tetrachloride and all other cleaners that may be a health hazard to personnel.

F.O.-128 increases cleaning and degreasing efficiency — does away with excessive maintenance costs, motor failures and wasted man hours.

- *zero residue on drying*
- *fifteen times more safe than carbon tetrachloride*
- *will not attack insulations*
- *non-corrosive*
- *will not produce dermatitis*


These unusual characteristics of F.O.-128 makes it ideal for cleaning all types of Diesel, electrical equipment.
Check into the safety and effectiveness of F.O.-128. Write today for details.
Now being used by an ever-increasing number of railroads from coast to coast.

Also Available—
F.O.-102 and F.O.-162—Carbon Removers
F.O.-106 and F.O.-116—Emulsion Cleaners

Our representative will be glad to call upon request. Write to Dept. "3".

FINE ORGANICS, Inc.
211 East 19th St. · New York 3, N.Y.

HELPS FROM MANUFACTURERS

The following compilation of literature—including pamphlets and data sheets—is offered free to railroad men by manufacturers to the railroad industry. To receive the desired information, write direct to the manufacturer.

1. CLEANING PROBLEMS. Recommended material and its advantages for each of 41 industrial maintenance cleaning problems listed in 6-page bulletin (67.2). (Write: *Magnus Chemical Company*, Dept. RLC, Garwood, N.J.)

2. RAILROAD EQUIPMENT. "Whiting Serves the Railroad Industry" is an illustrated 4-page folder describing the company's wheel grinder, train washers, drop tables, cross-over bridges, portable electric jacks, overhead cranes, Trambeam handling systems, and the heavy-duty Trackmobile. (Write: *Whiting Corporation*, Dept. RLC, 15639 Lathrop avenue, Harvey, Ill.

3. JOURNAL JACK AND BRASS TRIMMER. Four-page folder contains detailed specifications of the Yu-Brasser and tells how this combination journal jack and brass trimmer cuts car servicing costs. Illustrates how the device jacks journals, lifts a car to oil side bearings, trims brass, etc. (Write: *Earle C. Webster, National Sales Representative*, Dept. RLC, 55 New Montgomery street, San Francisco 5.)

4. FIRST AID KITS. 6-page First Aid Catalog lists over 100 Unit Packs; gives catalog numbers, and descriptions of Kits and Units designed to fit the specifications of every industry and the government. "Instant Guide to First Aid" pocket-size card, with latest information on first aid treatments, also included. (Write: *E. D. Bullard Company*, Dept. RLC, 275 Eighth street, San Francisco 3.)

5. MOLY-SULFIDE. "Moly-Sulfide in Chassis Greases," an 8-page bulletin (Lu-8a), explains how lubricant additive Moly-Sulfide functions in chassis grease and details its properties and current technological status. Reveals extensive on-the-job testing on trucks, trailers, buses, police cars and utility maintenance trucks as the result of laboratory and field experiences which indicate that the addition of 3% Moly-Sulfide of a fine particle size to chassis grease reduces wear on critical points and extends the lubrication period. Bulletin emphasizes company merely supplies Moly-Sulfide additive to oil and grease manufacturers. (Write: *Dept L, Climax Molybdenum Company*, 500 Fifth avenue, Dept. RLC, New York 36.)

6. STEEL FLOOR ARMORS. 12-page Specification and Installation Manual illustrates methods for prolonging life of industrial floors with Klemp Hexteel and Floorsteel, the former a rigid surface armor; the latter a flexible steel armored mesh. Report contains data tables, filler weights, specifications, illustrated installation procedures, etc. (Write: *Klemp Metal Grating Corporation*. Dept. RLC, 6615 South Melvina Avenue, Chicago 38.)

7. ELECTRONICS TESTING INSTRUMENTS. 6-page bulletin (2056) gives concise descriptions and specifications of products designed for use by radio, television, and refrigeration technicians. (Write: *Simpson Electric Company*, Dept. RLC, 5200 W. Kinzie street, Chicago 44.)

WHAT DESIGN OF FREIGHT CAR?—A CONTEST

A first prize of $1,000 and a second of $250 is being offered by Joseph T. Small, an analyst of railroad securities associated with Paine, Webber, Jackson & Curtis, a New York securities firm, for the best papers, graphic presentations, of both on the following topic:

"What design of freight car, or combination of car and 'container' will be ' meet the following combination of characteristics: (1) Save time and money for shippers and receivers; (2) control, or eliminate, damage to lading; (3) make possible lower manufacturing costs; (4) cut cost of maintenance; (5) reduce time out of service for repairs; (6) carry a wide range of commodities, and (7) lend itself to rapid and cheap adaptation to changing needs of commerce?"

Written presentations should be not more than 3,000 words in length and drawings should be of a character that can be mailed, flat or folded, in a 13-by 10-in envelope. Elaborate drawings are not required. Drawings and sketches should emphasize the conception as a whole, rather than details of components and design, and should be clear to people without formal engineering education.

The judges will be Arthur C. Schier, vice-president—traffic, General Foods Corporation; D. B. Jenks, president, Rock Island lines, and John W. Scallan, vice-president and general manager, Pullman-Standard Car Manufacturing Company.

The written essays, or presentations, should be typed, double- or triple-spaced, on one side of the paper only. The first page should contain *only* the (1) name, (2) address, and (3) occupation of the author. None of this information will be revealed to the judges or anyone prior to the selection of the winning essay.

Submissions, which will not be returnable, should be addressed to the Executive Editor, Railway Age, 30 Church street, New York 7, and must be received no later than September 30, 1956.

Similar prizes also are being offered by Mr. Small for the best essays on "What system of ownership and/or distribution will encourage the maintenance of an optimum fleet of modern freight cars."

Easier hand brushing is possible with WYANDOTTE-85, because it was specifically designed for heavy-duty exterior cleaning.

Faster machine washing, thorough, safe cleaning action are also possible with WYANDOTTE-85; and it ends window washing!

Have you seen Wyandotte-85 in action?

Now you can keep railway locomotives and cars new-looking and in the best of condition . . . easier, quicker, and at reduced use-cost . . . with new WYANDOTTE-85!

Removes imbedded dirt

WYANDOTTE-85 is a new exterior-equipment cleaner that is dustless, granular, and 100% soluble. It was *specifically developed* to fulfill railroad requirements for exterior maintenance cleaning of railway cars. Featuring fast, thorough, safe cleaning action, WYANDOTTE-85 gives speedy removal of brown road film and imbedded grime; rinses rapidly and completely. It even eliminates the hand cleaning of windows!

Eliminates paint damage

WYANDOTTE-85 leaves surfaces bright and clean, with less labor, and without paint damage. And it lowers use-cost, because only low concentrations are necessary for thorough cleaning.

Rinses freely, reduces corrosion

Both painted and stainless steel equipment can be kept free of oxide films and soil by regular washing with WYANDOTTE-85 at low concentrations. In addition, it substantially minimizes corrosion. Even when allowed to dry on surfaces, WYANDOTTE-85 solutions rinse freely with the usual hose rinsing.

Find out how effectively new WYANDOTTE-85 can keep your locomotives and cars bright and sparkling clean. Clip and mail coupon today. *Wyandotte Chemicals Corporation, Wyandotte, Michigan. Also Los Nietos, California. Offices in principal cities.*

Wyandotte CHEMICALS

J. B. FORD DIVISION

COMPLETE LINE OF CLEANERS FOR ALL RAILWAY NEEDS

WYANDOTTE CHEMICALS CORPORATION
WYANDOTTE, MICHIGAN

Gentlemen: I would like more information on Wyandotte railway-cleaning products.

- ☐ Have representative call on me.
- ☐ Send FREE book on "Railway Cleaners and Cleaning Procedures."

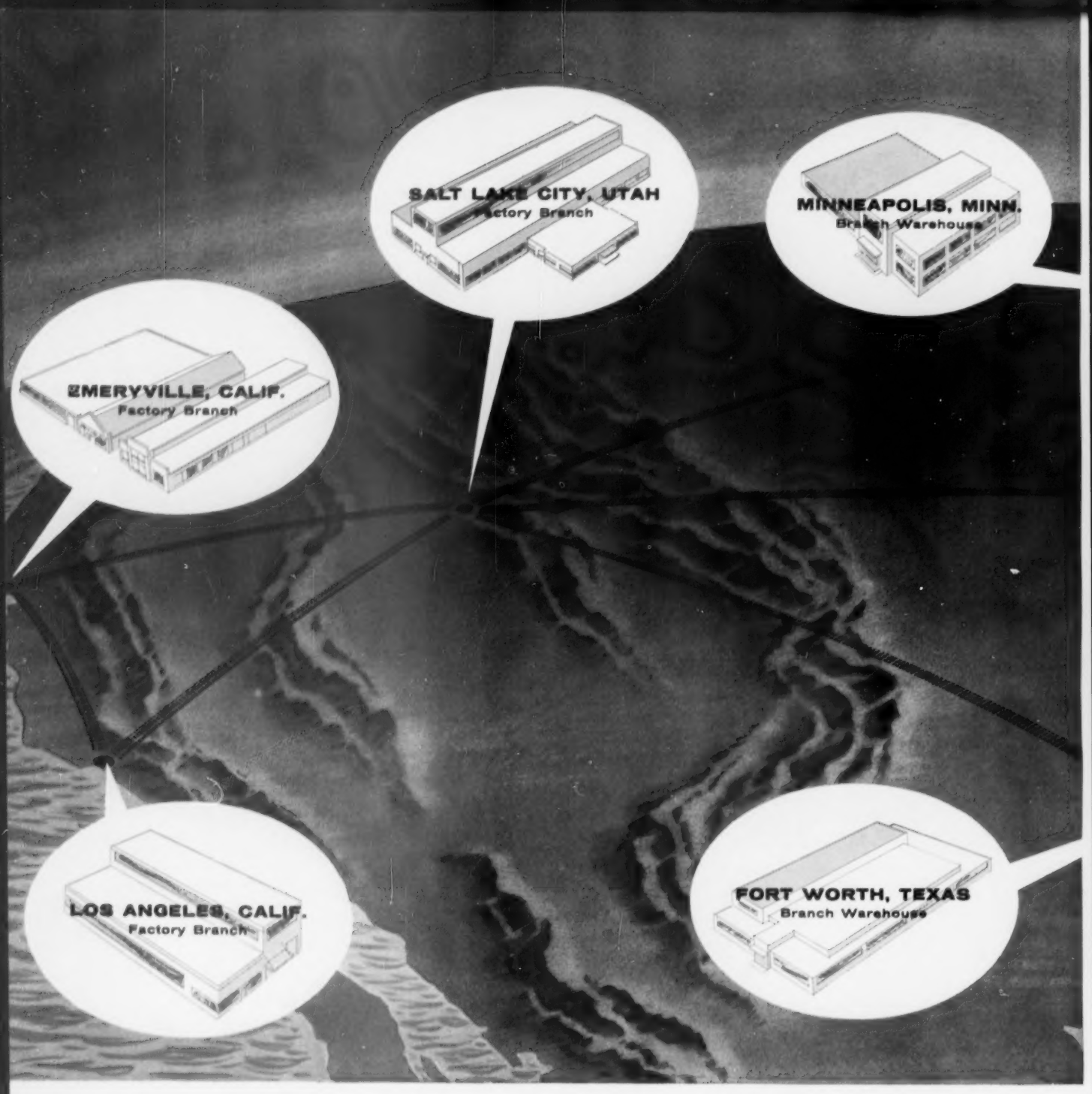
Name _____

Railroad _____

Department _____

Address _____

City _____ Zone _____ State _____



"ON-LINE" SERVICE FOR 96% of all General

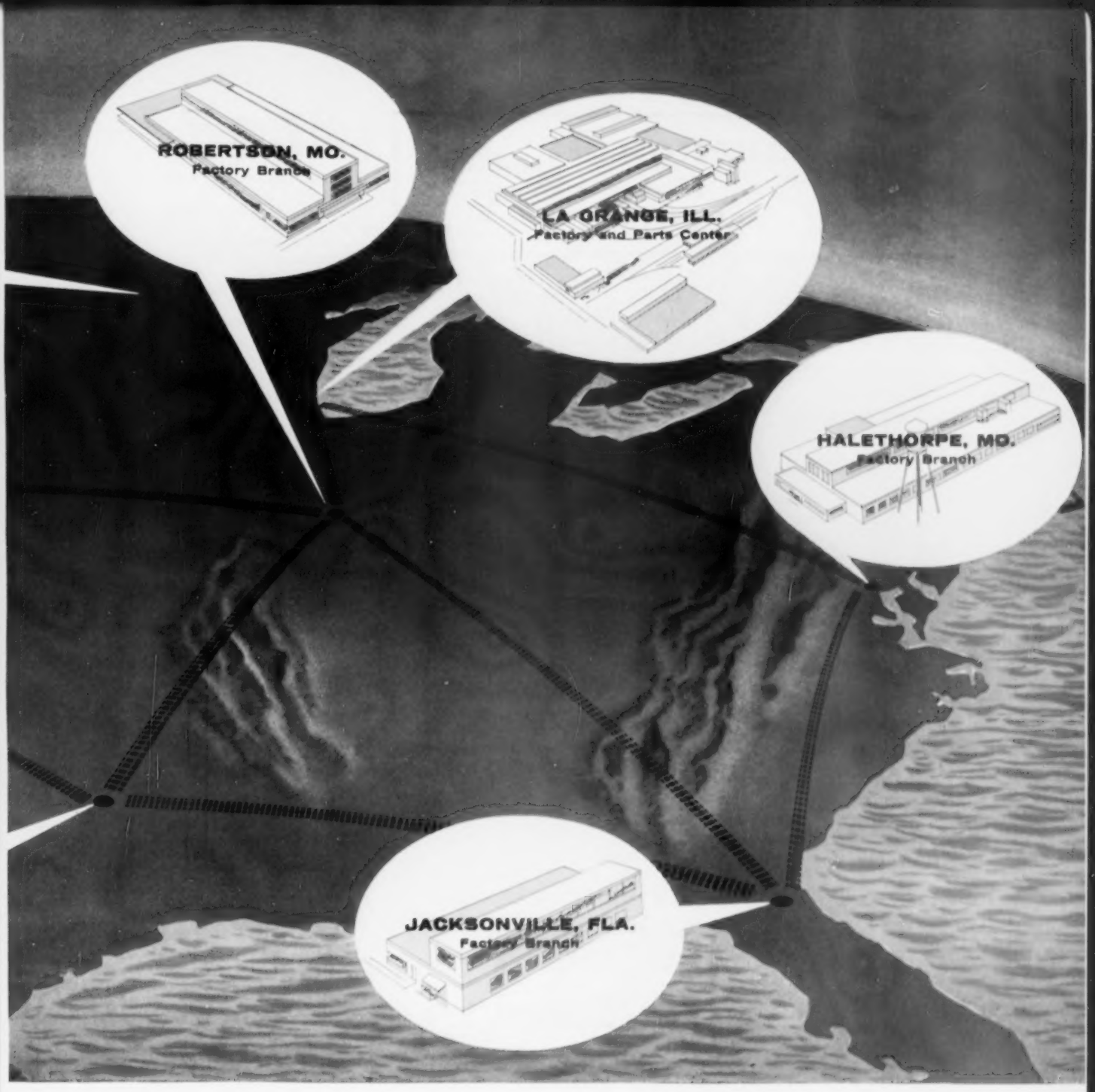
ELECTRO-MOTIVE'S strategic network of Factory Branches and Warehouses puts genuine General Motors locomotive parts within 24 hours of any point in the United States.

It provides "on-line" service for 96% of all General Motors locomotives in this country.

Six factory branches, plus our facilities at La Grange, handle *remanufacture* of major components with the same production-line efficiencies, the same laborsaving tools and equipment used in original manufacture.

Traction motors and other major components are available for immediate shipment on "Unit Exchange." You don't need to hold a locomotive out of service waiting for an assembly to be rebuilt. You can get factory-rebuilt motors overnight—and pay no premium for this service.

Latest improvements in design and manufacture are



Motors Locomotives in the United States

automatically incorporated—and you get the same warranty on "Unit Exchange" as on brand-new assembly.

In addition to saving investment in unneeded facilities, you can operate with smaller inventories—save transportation costs—and keep your locomotives at work more hours per year.

For further information on this moneysaving service, write us or consult your Electro-Motive Representative.

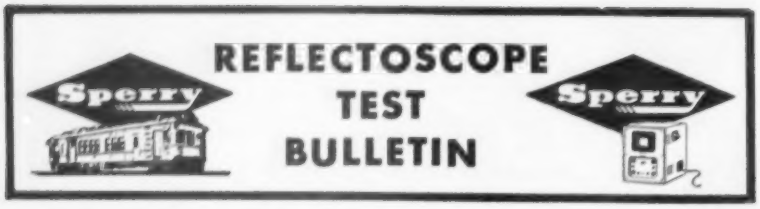
Electro-Motive Division

GENERAL MOTORS · LA GRANGE, ILLINOIS

Home of the Diesel Locomotive

GENERAL MOTORS LOCOMOTIVES

In Canada: GENERAL MOTORS DIESEL LIMITED
London, Ontario

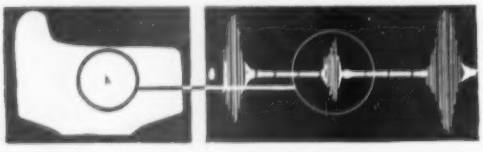


ULTRASONIC WHEEL INSPECTION
Finds Flaws Before They Become Failures

Diesel, passenger and steel freight car wheels are being accurately, quickly and economically tested for internal defects with the Sperry Ultrasonic Reflectoscope. With today's faster trains and heavier loads, maintenance departments need, more than ever, such an efficient, reliable method of wheel inspection.

While ultrasonic testing at point of manufacture will assure that new wheels are free from defect at delivery, there are still millions of wheels in use – in every category of service life – that never have been tested. Periodic testing of all wheels is your assurance of fewer failures.

How Reflectoscope Works



A narrow beam of high-frequency sound penetrates the test piece or area and is reflected from any defect in its path – immediately and accurately picturing the defect on the Reflectoscope cathode ray tube. The Reflectoscope picture above shows a defect in a wheel rim. The cross section of the actual rim shows the defect – just where the Reflectoscope indicated it would be.

Locating internal flaws before they cause wheel failures is positive insurance against costly derailments . . . Reflectoscope inspection is the most accurate, economical method of locating wheel defects. Ask your Sperry Sales Engineer to show you how Reflectoscope works and how it can fit into your maintenance schedule. For more detailed information return the coupon below.

Sperry
SPERRY RAIL SERVICE
Division of Sperry Products, Inc.
Danbury, Connecticut

Send details of ultrasonic inspection for railroad equipment.

Name _____ Title _____

Address _____

City _____ Zone _____ State _____

READERS LAMENTS AND CHEERS

(Continued from page 8)

men for the railroad industry should not be more than in any other industry.

Your editorials on this subject should enlighten railroad managements and undoubtedly help them obtain and keep the college technically trained men.

F. Fahland,
General mechanical engineer,
Union Pacific

Too Many Specialists

"Why Can't the Railroads Keep Good Men?" is extra good. Railroads are 20 years behind times in this regard. Too many specialists and not enough general practitioners in all-around railroad problems. Poor pay.

Kent Bundy,
Railroad Fireman,
Great Northern

AIR BRAKE SCHEMATICS

We Have More . . .

. . . this article and method appealed to me very much, enough so that I went right out and got a set of pencils of the proper colors in order to take advantage of this opportunity to increase my knowledge of modern airbrakes. However, I was quite disappointed when the April issue came and did not contain the second article in the proposed series. Your letter, though, has renewed my hope that the series will be continued.

Personally, I believe this series will be valuable to anyone wishing to study air brakes for, as you know, suitable study material is not too readily available. I do hope that enough interest is shown in this project to justify its continuance.

H. L. Kitchen
Fireman engineer,
Seaboard Air Line

(The second article in this series appears on pages 51-54, inclusive, of the July issue. For the benefit of other readers like Mr. Kitchen, we are glad to say that subsequent articles will probably appear in September, October and December of this year.—Editor.)

Our Fault, Mr. Rodgers

. . . You never cease to amaze me in how you can keep on issuing articles which are outstanding—articles which are uppermost in my mind and well presented. I like it!

In my apprenticeship, I did work with air and I had my problems trying to understand it. Your preliminary article has already cleared up some of my old problems. I am going to follow each one of the series.

Now for the dislikes. In the color chart the signal system is listed as "light blue," No. 865. Other places light blue is listed as 845. Is this an error? At the bottom of page 76 it says, "Note that brown is

Speer Brushes always make the grade....

Generator Brush
Speer Grade E44 Multiflex®

Traction Motor Brush
Speer Grade 6758 Multiflex®

with long life...outstanding performance

For the long haul, you will find that Speer brushes are service-designed to give you even wear, reduced vibration . . . improved commutation, longer service life.

Here are two Speer brushes that are especially designed for use on mainline locomotives:

Generator Brush (left above)
Speer's grade E44 Multiflex brush is a tough, dense grade developed specifically to give long, maintenance-free service on diesel-electric locomotive main generators.

Traction Motor Brush (right above)
Speer's grade 6758 Multiflex brush is a strong, dense, high, contact-drop grade for diesel-electric locomotive traction motors. Two independent sections give it all the advantages of a double brush—yet it operates in a single holder.

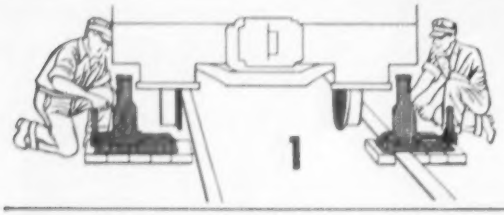
Speer offers a complete range of brushes. Every Speer brush is designed to give long, sturdy use under rugged operating conditions. Whether you maintain industrial motive units or higher hp diesel-electric locomotives, there's a Speer brush *made especially* for your equipment. Write today for full information.

If you have not received your free copy of our catalog, BRUSHES BY SPEER, send for it today.

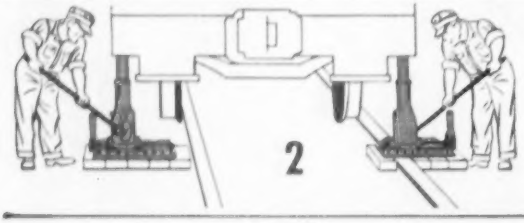
SPEER *Carbon Co.*
St. Marys, Pa.

How to get back on the track quickly

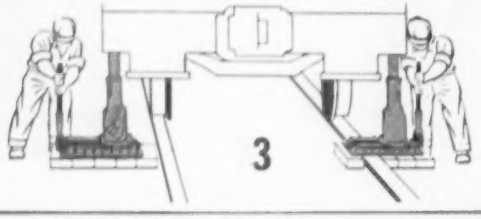
Without A Crane!



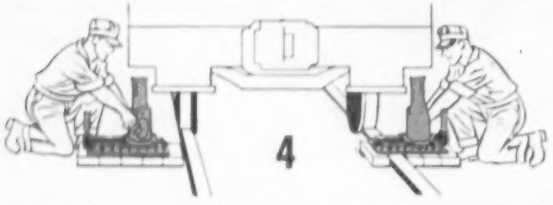
Place a *Duff-Norton traversing base* and jack beside each derailed truck.



Jack up the car or locomotive until wheels clear top of rails.

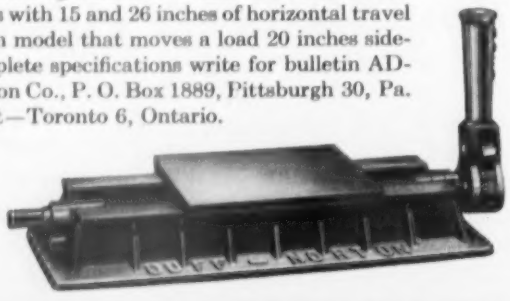


Move jacks horizontally simultaneously on traversing bases until wheels are in alignment with rails.



Lower wheels; you are back on the track, quickly, inexpensively and without danger of distorting car or locomotive frame.

Duff-Norton traversing bases are available in two 50-ton capacity models with 15 and 26 inches of horizontal travel and one 100-ton model that moves a load 20 inches sideways. For complete specifications write for bulletin AD-4-G, Duff-Norton Co., P. O. Box 1889, Pittsburgh 30, Pa. Canadian plant—Toronto 6, Ontario.



DUFF-NORTON

"Giving The Railroads A Lift Since 1883"

Jacks

mentioned in two shades—light and dark. This can be done with the same pencil by varying the pressure on the point." Couldn't Terra Cotta, No. 813, be used? In my experience with training a greater distinction must be used than can be gained by "varying the pressure."

Glenn E. Rodgers,
Supervisor diesel instruction car, Atchison, Topeka & Santa Fe

(Mr. Rodgers' comment now gives us an opportunity to call other readers' attention to the fact that an error did appear in the color guide in the March issue. The proper colored pencil number for light blue is 845.—Editor.)

We Know Where!

It would appear that many would find it difficult to obtain the 12 different colored pencils as numbered on the color chart. Perhaps an alternate simplified method of coloring could be suggested, using fewer colors and interspersing them in combinations. Where colors are closely related, they sometimes are difficult to distinguish. Another suggestion would be that your article advise where a combination box of the Mongol type indelible pencils can be obtained in the event the reader is unable to obtain them through his local dealer.

B. E. Johnson,
Mechanical inspector, Burlington Lines

(Possibly some of our readers may have the difficulty in securing the proper set of colored pencils such as Mr. Johnson mentions. The pencils should be obtainable at any stationery store, except possibly in smaller outlying towns. If any reader finds himself handicapped by the inability to secure these pencils and will drop us a note, we will be glad to tell him how to get them by mail.—Editor.)

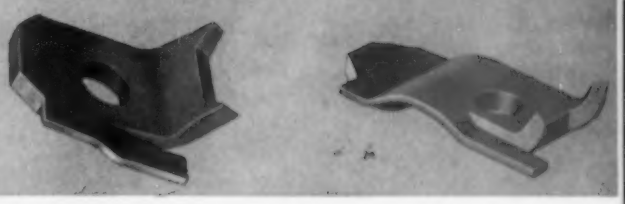
WANTED

Technically trained man, 26-35 years, with mechanical or electrical degree, having at least five years' railroad experience in connection with the operation and maintenance of mechanical and electrical equipment of cars and locomotives. The ability to prepare technical reports and articles is a necessity, and the man selected will be given an opportunity which will pay him a good salary while being trained. The job requires traveling in the western United States, with headquarters in Chicago. If you are interested, tell us about yourself and your experience. Your reply will be held confidential. Address: *Box 750, Railway Locomotives and Cars, 30 Church street, New York 7.*

why punch the sill?

ONLY ONE HOLE NEEDED WITH

M-F FLOOR CLIPS

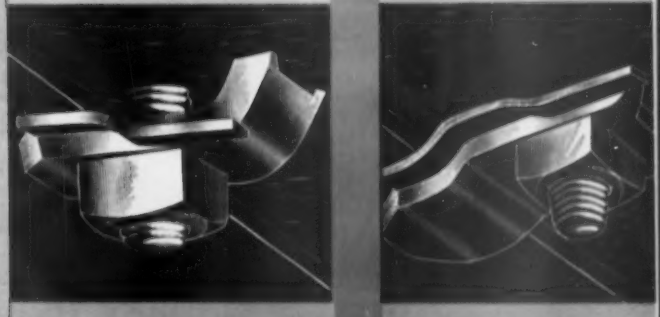


STYLE F (Bridge Type)
Style F Clip will clamp the sill more tightly because the bolt is closer to the sill. It can also absorb variation in offset better than Style G.

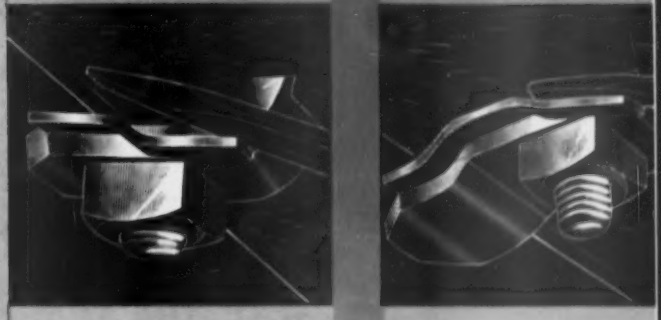
STYLE G (Offset Type)
This Clip has one great advantage . . . no matter what the sill condition, the floor bolts are always the same length. This advantage becomes increasingly great when the offset becomes large.

"M-F" Lock-Tight Clip Style F in position

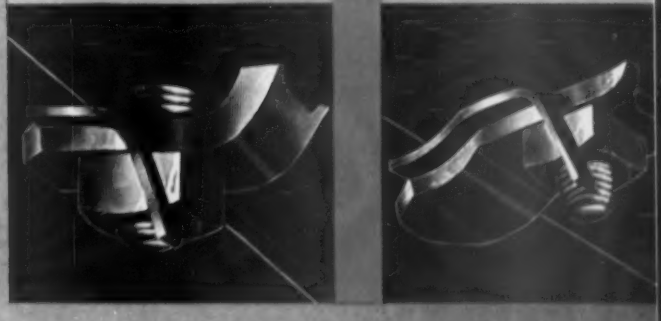
"M-F" Lock-Tight Clip Style G in position.



Screw-driver in position to bend flange.



Nut-locking flange bent into position.



DRILL HOLES FROM ABOVE—AND FARTHER FROM BOARD END—stronger sills, stronger boards!

M-F Floor Clips not only cut costs and speed new car construction, but when boards are *added*, there are *no new* holes to drill, *no new* bolts required, *no old* holes to plug!" . . . always drilled on the board center-line, prevents warping or tipping. *Re-use* the same clip throughout the life of the car!

USE THE M-F Water-Tight™ Bolt for a smooth floor surface and maximum bolt tension.

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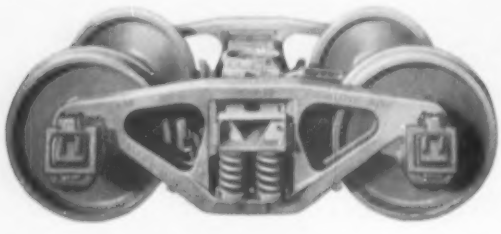
THE TRANSPORTATION DEPARTMENT

. . . wants smooth, easy rides for valuable cargoes — lowered damage claims. Transportation men want to cooperate, too, with mechanical men who *know* how Barber Stabilized Trucks save in maintenance costs. So they agree!

Specify Smoother-Riding



BARBER
STABILIZED TRUCKS

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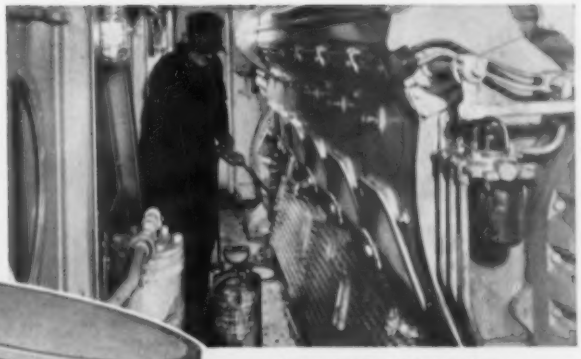
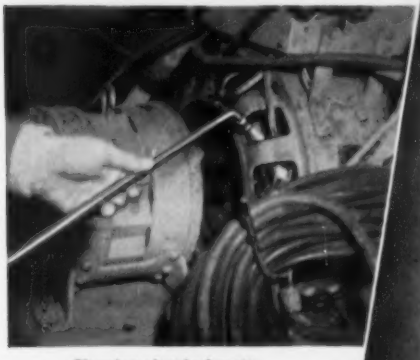


Spray cleaning diesel engines.



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Cleaning washrooms.

Only the right cleaner does the job right

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The installation of Streamlite HAIRINSUL into new refrigerator cars is a one-time investment, because it outlasts the life of the car, and can be used again and again.

The successful use of all-hair HAIRINSUL in refrigerator cars for half a century is the best testimony that service conditions never impair its high insulating efficiency.

Some of the major reasons why Streamlite HAIRINSUL is specified by leading refrigerator car lines are given at the right. Write for complete data.

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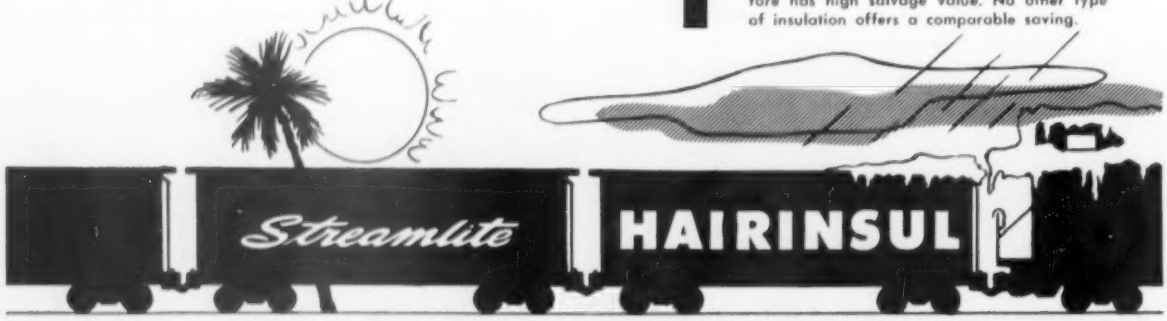
- **LOW CONDUCTIVITY** — Thoroughly washed and sterilized, all-hair heat barrier. Rated conductivity — .25 btu per square foot, per hour, per degree F., per inch thick.
- **LIGHT WEIGHT** — Advanced processing methods reduce weight of STREAMLITE HAIRINSUL by 40%.
- **PERMANENT** — Does not disintegrate when wet, resists absorption. Will not shake down, is fire resistant and odorless.
- **EASY TO INSTALL** — Blankets may be applied to car wall in one piece, from sill to plate and from one side door to the other. Self-supporting in wall section between fasteners.
- **COMPLETE RANGE** — STREAMLITE HAIRINSUL is available ½" to 4" thick, up to 127" wide. Stitched on 5" or 10" centers between two layers of reinforced asphalt laminated paper. Other weights and facings are available.
- **HIGH SALVAGE VALUE** — The all-hair content does not deteriorate with age; therefore has high salvage value. No other type of insulation offers a comparable saving.



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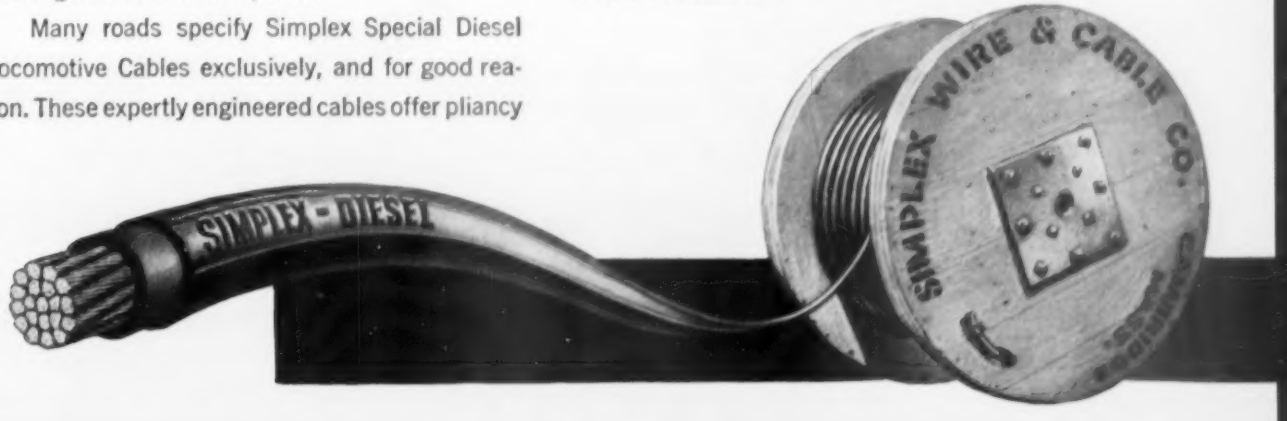
Many roads specify Simplex Special Diesel Locomotive Cables exclusively, and for good reason. These expertly engineered cables offer pliancy of handling, resistance to abrasion and to damage by oil, heat or flame.

Next time you order, make it a point to specify SIMPLEX SPECIAL DIESEL LOCOMOTIVE wires and cables, the cables designed for championship performance. **SIMPLEX WIRE & CABLE CO.,** Railroad Dept., 79 Sidney Street, Cambridge 39, Massachusetts.



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METAL BONDED TO PLYWOOD

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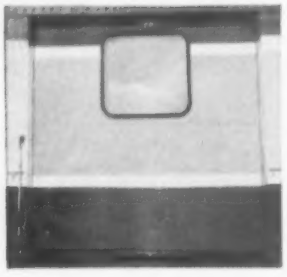
NO WARPING
★ NO TWISTING
NO SWELLING

BAGGAGE AND POSTAL CAR DOORS



Completely weatherproof Met-L-Wood doors effectively prevent internal rust and rot... and their tough, smooth surfaces stay new-looking for years. Stainless steel channels along bottom edges of sliding doors are rustproof... virtually wearproof. All-rubber window sash installed or removed in minutes... rattle-proof... water- and weatherproof. Available in full width and split types ... sizes to meet all needs.

Exclusive Split Door Seal

Drawing above shows simple Met-L-Wood Split Door Seal which assures weather- and watertightness for years of continual use. Seal also provides effective cushion when closing split doors.

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Sound-deadening, insulating, vibration-damping Met-L-Wood doors for passenger cars add to service life, cut deadweight ... Combine modern, clean-line beauty with great strength and durability. Furnished for manual or automatic operation, with or without hardware assembly. Tapping plates for hardware are built into doors ... invisible additions to strength and trouble-free service life. Sizes and types to fit all requirements ... exact dimensions insure quick assembly and perfect fit. Door thicknesses from ½" up, as required.

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Met-L-Wood Bulletin 520 gives the complete, illustrated story on Met-L-Wood doors for railroad uses ... shows construction details, describes standard and special types and sizes. Your copy sent free upon request—write for it today.

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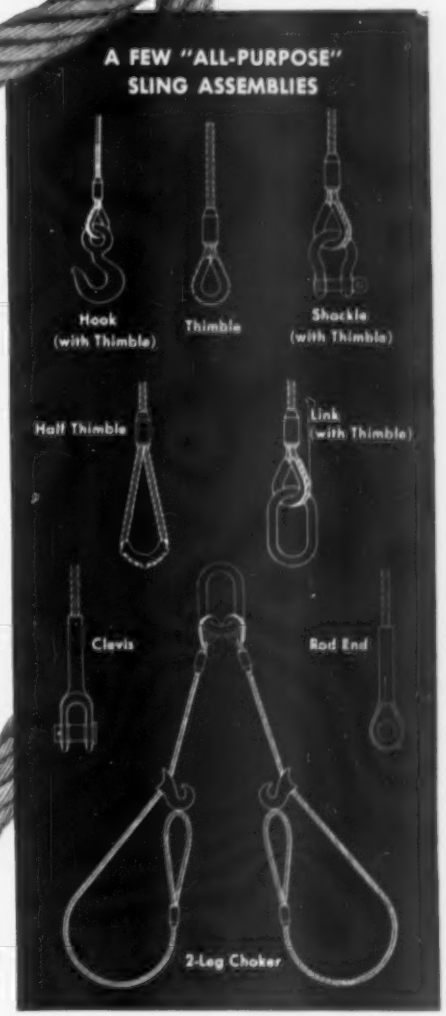

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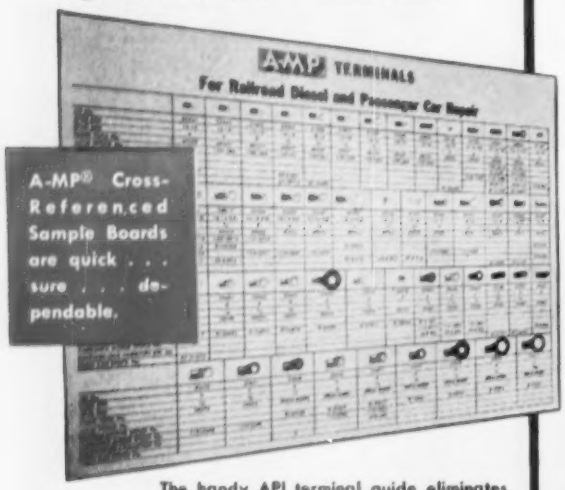
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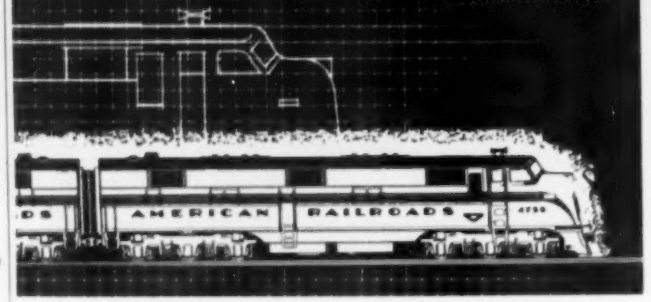

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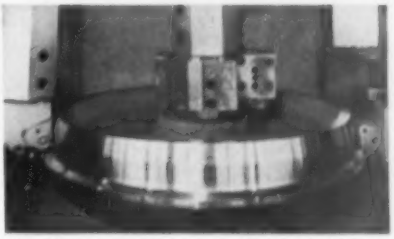

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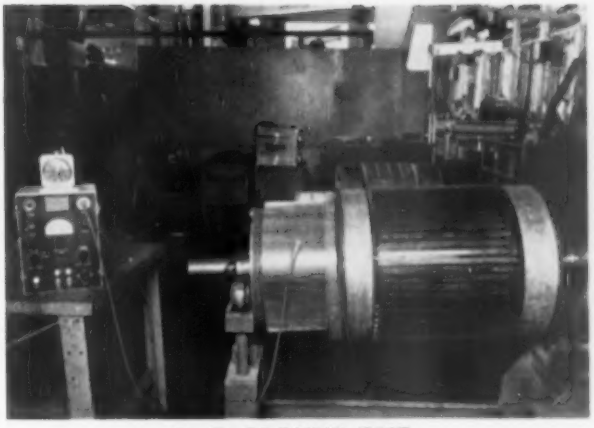
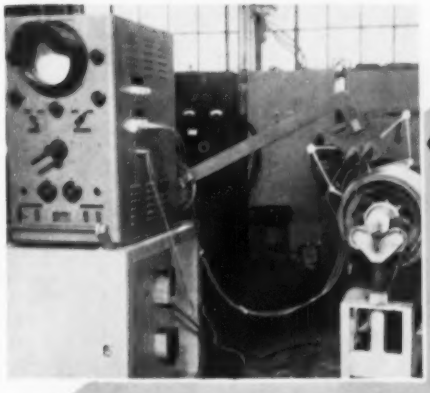
These tests insure the consistent high quality of National traction motor rewinding...



D. C. GROUND TEST

Excess leakage on the D. C. ground test indicates questionable ground insulation, inadequate cleaning, an insufficient baking cycle or an improperly conditioned winding.



SURGE COMPARISON TEST

This test simultaneously stresses the ground and turn insulation in a manner similar to that encountered when a flashover occurs in service. Weak turn insulation is immediately revealed by the application of the controlled surge voltage.

A. C. GROUND TEST

In accordance with accepted practice, all armature windings are given a standard AIEE one-minute A. C. ground test.

DUCTER TEST

A low resistance ohmmeter capable of measuring resistance of .000001 of an ohm is used to locate possible high resistance connections by measuring the resistance between adjacent bars.

BAR-TO-BAR TEST

Shorted bars, whether caused by a short-circuited turn or by the presence of copper dust between adjacent bars, are quickly located with the electronic armature bar-to-bar tester.

Complete and careful testing is only one of the reasons why National should be your first source for traction motor rewinding. For the complete story, call your nearby National field engineer. If you don't know him, just drop us a line.

NATIONAL ELECTRIC COIL COMPANY

COLUMBUS 16, OHIO, U. S. A.

ELECTRICAL ENGINEERS: MAKERS OF ELECTRICAL COILS AND INSULATION—REDESIGNING AND REPAIRING OF ROTATING ELECTRICAL MACHINES

"A CURE IS BETTER THAN *A CRUTCH"*

Crutches don't cure the Hot Box problem . . . but Timken bearings do

. . . and TIMKEN bearings pay for themselves over and over and over in operating and maintenance savings

GIVING friction bearings "crutches"—devices attempting to improve performance—never cures the hot box problem. But Timken® bearings *cure* it, because they eliminate the *cause* of hot boxes—the friction bearing itself.

HOW SAVINGS MOUNT

Timken bearings eliminate the frequent inspection and lubrication that are necessary to keep friction bearings operating even with "crutches". Terminal bearing inspection is cut 90%. Lubricant costs are slashed as much as 95%. Fact is, the new Timken heavy-duty type AP (All Purpose) bearing assembly will go three years without the addition of lubricant. Costs less to use and to install too. When all railroads go "Roller Freight", they'll save an estimated $224 million a year, earn about a 22% net annual return on the investment.

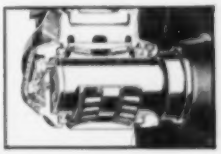
The reason Timken bearings eliminate the hot box problem is—they *roll* the load. They don't slide it as friction bearings do. There's no metal-to-metal sliding friction. And the reason Timken bearings are the only journal bearings you can count on to cure the hot box problem *and* cut costs to the bone is—their tapered roller design. It prevents lateral movement. There's no scuffing or skewing, bearings last longer. There's no pumping action, so less lubricant is required.

THE TAPER HOLDS THE "SECRET"

We even make our own bearing steel to assure Timken bearing quality. We take this extra step to be sure it's the finest, toughest steel available. No other American bearing maker does.

Compared to the cost of buying and maintaining "crutch" devices that never cure, the difference in price between friction bearings and roller bearings is smaller today than ever. Costs can be reduced even more, as shown by a practical conversion plan one major American railroad has adopted. Whenever a freight car of this railroad comes into its shops for major repairs, it is converted to roller bearings. This plan helps maintain a steady shop and labor schedule, reduces bearing installation cost.

CONVERTING THE PRACTICAL WAY

There's no longer any need to try and "get by" with costly "crutches". They don't cure the hot box problem. But Timken bearings *do*—and give maximum savings in operating and maintenance cost. That's why 7 out of 10 roller bearing equipped freight cars roll on Timken bearings. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

7 out of 10 roller bearing freight cars roll on TIMKEN tapered roller bearings